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TRANSACTIONS

OF THE

American Dental Association

AT ITS

FIFTEENTH ANNUAL SESSION

HELD AT NIAGARA FALLS,

August 3d, 4th, 5th and 6th, 1875.

PUBLICATION COMMITTEE:

C. STODDARD SMITH, G. H. CUSHING, G. C. DABOLL.

SPRINGFIELD, ILLS:
STATE REGISTER STEAM PRINTING HOUSE.
1876.

DISCLAIMER.

The AMERICAN DENTAL ASSOCIATION, although formally accepting and publishing the reports of the various Standing Committees, and the essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when otherwise decided by special resolution.—*Constitution.*

ERRATA.

Page 83, second line from top, for "Hch." read "4 Hcl."

Page 84, near close of first paragraph, for "oxalate acid," (over 2 C, H_2 O_4) read "oxalic acid."

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Committee on Nominations.—L. D. SHEPARD, *Chairman;* T. L. BUCKINGHAM, S. B. PALMER.

CONTENTS.

MINUTES OF THE SECRETARY. PAGE.

Roll Call 9
Report of Committee on Credentials 12
Rejection of Amendment to Art. IV, Constitution 13
Adoption of Amendment to Art's. III, IV and V, Constitution 14
Rejection of sundry Amendments 14
Resolutions on Dental Education—adoption of 14
Treasurer's Report 15
Resolution on Physiology—Dr. Allen 16
Report of publication Committee 16
Instructions to publication Committee 17, 18
Close of Dental Depots—Resolution 17
Resolutions on the death of Dr. Asa Hill 18, 21, 23
Committee of Conference with A. D. Con 18
Election of Officers 19
Selection of place of next meeting 19
Resolution to pay orders on the treasury 19, 21
Remarks of Dr. Flagg—expunging of 20
Standing Committees 20
Resolution of thanks—Ex. Com., Hotels, etc 22
Report of Com. on Barnum Testimonial 22
Special Committee of Arrangements 22
Publication Committee 22

REPORTS OF COMMITTEES AND VOLUNTEER ESSAYS.

PAGE.

Volunteer Essay on Dental Physiology—Jno. Allen..... 27
Report on Histology and Microscopy—W. H. Jackson..... 50
Additional Report on same—E. D. Swain..... 54
Report on Dental Chemistry—H. A. Smith..... 74
Report on Operative Dentistry—S. H. McCall..... 96
Supplemental Report on same—C. S. Stockton 103
Report on Mechanical Dentistry—F. H. Rehwinkel..... 123
Report on Dental Education—G W. Keely..... 135
Volunteer Essay on same—J. Foster Flagg..... 139
Report on Dental Literature..I. Knapp 152
Volunteer Essay on Replanting Teeth—W. N. Morrison..... 162
Report of Committee on Instruments and Appliances 167

DISCUSSIONS.

DENTAL PHYSIOLOGY, ETC.

Discussed by Dr. Atkinson..... 31, 34, 48
Dr. McQuillen..... 34
Dr. Magill..... 35
Dr. Flagg..... 35, 46
Dr. Taft..... 37, 39, 42, 49
Dr. Rehwinkel..... 38
Dr. Morgan..... 40
Dr. Barrett..... 41, 46
Dr. McQuillen..... 42
Dr. Jno. Allen..... 44
Dr. Shepard..... 44

HISTOLOGY AND MICROSCOPY.

Discussed by Dr. Atkinson..... 65, 71
Dr. McQuillen..... 68

DENTAL CHEMISTRY. PAGE.

Discussed by Dr. Palmer 84, 89, 90
Dr. Dean 88
Dr. Taft 89, 90, 91
Dr. Osmond 90
Dr. Rehwinkel 93
Dr. Hunter 94
Dr. Daboll 95

OPERATIVE DENTISTRY.

Discussed by Dr. Taft 106
Dr. Atkinson 106, 111
Dr. Abbott 107, 113, 114, 118
Dr. McKellops 109
Dr. Rehwinkel 110, 112, 114
Dr. Morgan 112
Dr. Rawls 114
Dr. Butler 117
Dr. Flagg 119

MECHANICAL DENTISTRY.

Discussed by Dr. Stockton 130
Dr. D. D. Smith 131
Dr. Abbott 133
Dr. Atkinson 133
Dr. Barrett 134

DENTAL EDUCATION.

Discussed by Dr. Shepard 146
Dr. McQuillen 148
Dr. Atkinson 151
Dr. Abbott 15

PATHOLOGY AND THERAPEUTICS. PAGE

Discussed by Dr. Atkinson....175, 179
Dr. Taft....178, 180
Dr. W. H. Allen....182
Dr. Stockton....182
Dr. Osmond....182
Dr. Flagg....183
Dr. Shepard....183
Dr. Abbott....183
Dr. Morrison....183
Dr. I. Knapp....183
Dr. Butler....184
Dr. C. S. Smith....184
Dr. Harlan....184

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION,

SESSION OF 1875.

BY C. STODDARD SMITH, SECRETARY.

GRANT'S HALL, NIAGARA FALLS,
August 31d, 1875.

THE fifteenth Annual Session of the AMERICAN DENTAL ASSOCIATION convened at the above time and place, and was called to order at 10:30 A. M. by the President, Dr. M. S. DEAN.

The roll was called and the following delegates and permanent members were reported as having paid their dues, those marked with an * not being present, but forwarding their dues:

F. ABBOTT.....78 West Twelfth St., New York.
JOHN ALLEN.....314 Fifth Avenue, New York.
W. H. ALLEN,.....18 W. 11th St., New York.
CHAS. F. ALLEN,.....Newburg, New York.
*H. L. AMBLER,.....114 Euclid Ave., Cleveland, O.
*J. J. ANDERSON,.....Springfield, Mass.
W. H. ATKINSON.....41 East Ninth St., New York.
J. M. AUSTIN,.....76 Felix St., St. Joseph, Mo.

W. C. Barrett,.....Warsaw, N. Y.
W. A. Barrows,.....Buffalo, N. Y.
C. H. Biddle,.....133 Pacific St., Brooklyn, N. Y.
H. J. Billing.....Louisville, Ky.
*J. J. Birge.....San Francisco, Cal.
C. A. Brackett,.....113 Thames St., Newport, R. I.
A. H. Brockway,.....13 Green Ave., Brooklyn, N. Y.
*W. A. Bronson,.....8 East 34th St., New York.
Seneca B. Brown,.....Fort Wayne, Ind.
*L. Buffett,.....Cleveland, Ohio.
C. R. Butler,.....114 Euclid Ave., Cleveland, O.

J. F. Canine, ...Louisville, Ky.
J. S. Cassidy,.....Covington, Ky.
Thos. H. Chandler,.....222 Tremont St., Boston.
*M. L. Chaim,.....30 Cooper Institute, N. Y.
Thos. Cogswell,.....Boston, Mass.
*C. D. Cook,.....133 Pacific St., Brooklyn, N. Y.
*Aaron Colton, ...Hudson, N. Y.
*J. N. Crouse,.....652 Wabash Ave., Chicago.

G. C. Daboll,.....Buffalo N. Y.
M. S. Dean... .....174 State St, Chicago.
*S. W. Dennis,.....San Francisco, Cal.
*D. S. Dickerman,.....Taunton, Mass.
*R. B. Donaldson,.....413 Penn. Ave., Washington, D. C.
*B. Oscar Doyle,.....Louisville, Ky.
*I. Douglass, ...Romeo, Mich.
Chas. E. Dunn,.....Louisville, Ky.

Geo. E. Elliot, ...Meadville, Pa.
C. D. Elliot,.....Franklin, Pa.

Geo. L. Field,.....Campus Martius, Detroit, Mich.
J. Foster Flagg.....Philadelphia, Pa.
*S. A. Freeman,.....416 Main St., Buffalo, N. Y.

E. S. Gaylord,.....New Haven, Ct.
W. H. Goddard, ...65 West Walnut St., Louisville, Ky.

A. W. Harlan,.....Randolph St., Chicago.
D. C. Hawxhurst,.....Battle Creek, Mich.
F. Herrick.....Greenville, Pa.
J. L. Hill,.....Gettysburg, Pa.

*E. Honsinger,.....318 Park Ave., Chicago.
F. A. Hunter,.....192 7th St., Cincinnati, O.
E. Hunter,.....Manchester, Mich.
P. G. C. Hunt,.....Indianapolis, Ind.
E. S. Holmes,.....Grand Rapids, Mich.

*J. K. Jamison,.....Connersville, Ind.

Geo. W. Keely,.....Oxford, Ohio.
D. E. Kelly,.....Ashtabula, O.
G. W. Klump,.....Williamsport, Pa.
I. Knapp,.....Fort Wayne, Ind.

H. K. Lathrop, Jr.,.....153 Woodward Ave., Detroit, Mich.

W. E. Magill,.....Erie, Pa.
*J. Frank Marriner,.....Ottawa, Ills.
W. N. Morrison,.....St. Louis, Mo.
W. H. Morgan,.....Nashville, Tenn.
Henry W. Morgan.....Nashville, Tenn.
W. S. Moores,.....Maysville, Ky.
B. R. McGregor,.....Rochester, N. Y.
H. J. McKellopps,.....St. Louis, Mo.
Jas. McManus,.....Hartford, Conn.
J. T. McMillan,.....Paris, Ky.
J. H. McQuillen,.....2100 Arch St., Philadelphia, Pa.

*H. B. Noble,.....1111 Penn. Ave., Washington, D. C.
L. G. Noel,.....Nashville, Tenn.
A. L. Northrop,.....44 West 46th St., New York.

F. M. Odell,.....18 West 11th St., New York.
E. Osmond,.....216 Vine St., Cincinnati, O.

Corydon Palmer.....New York.
S. B. Palmer,.....Syracuse, N. Y.
*C. N. Pierce,.....501 North 7th St., Philadelphia.
W. Pinney,.....Newark, N. J.

A. O. Rawls,.....Lexington, Ky.
L. E. Reading,.....Trenton, N. J.
F. H. Rehwinkel,.....Chillicothe, O.
H. M. Reid,.....Cincinnati, O.
F. J. Richards,.....Williamsport, Pa.

*H. L. Sage,.....Bridgeport, Ct.
*J. N. Scranton,.....Bennington, Vt.
L. D. Shepard,.....Hotel Boylston, Boston.
F. N. Seabury,.....Providence, R. I.
C. Stoddard Smith,.....Springfield, Ill.
D. D. Smith,.....147 Walnut St., Philadelphia, Pa.
J. H. Smith,.....New Haven, Conn.
H. A. Smith,.....286 Race St., Cincinnati, O.
A. W. Smith,.....Richmond, Ky.
John Stephan,.....85 Michigan St., Cleveland, O.
C. S. Stockton,.....15 Cedar St., Newark, N. J.
J. S. Swartley,.....740 Michigan Ave., Chicago.
*E. D. Swain,.....67 Washington St., Chicago.

J. Taft,.....117 West 4th St., Cincinnati, O.
T. C. Tiernay,.....107 West 41st St., New York.
L. C. Taylor,.....57 Church St., Hartford, Conn.
G. R. Thomas,.....Detroit, Mich.
W. Lewis Tucker,.....11 Ashburton Place, Boston.

W. T. Wallace,.....Kingsville, O.
*G. F. Waters,.....8 Beacon St., Boston, Mass.
M. H. Webb,.....Lancaster, Pa.
Merritt Wells,.....Indianapolis, Ind.
*C. F. Wheeler,.....Albany, N. Y.
F. S. Whitsler,.....Youngstown, O.
*J. C. Whinery,.....Salem, Ohio.
E. M. Wolfe,.....Oil City, Pa.

Back dues were received from the following members:

Chas. Merrit, (for 1874).....25 West 23d St., New York.
J. G. Ambler, (for 1874).....25 West 23d St., New York.
Geo. T. Moffatt, (for '73–'74).....Boston, Mass.
H. H. Pierson, (for 1874).....Sacramento, Cal.

The reading of the minutes of the last meeting was proceeded with, but on motion, the further reading was dispensed with.

The Committee on Credentials made a partial report, which as amended by various supplemental reports, was accepted and adopted as follows:

American Academy of Dental Science—F. N. Seabury, W. L. Tucker, L. D. Shepard.

Chicago Dental Society—M. S. Dean, A. W. Harlan.

Connecticut Valley Dental Society—J. H. Smith, C. A. Brackett.

Connecticut State Dental Association—L. C. Taylor.

Dental Society of the State of New York—W. C. Barrett, G. C. Daboll, S. A. Freeman, S. B. Palmer.

Dental Society of the First Judicial District of the State of New York—F. M. Odell, T. C. Tierney.

Dental Society of the Eighth Judicial District of the State of New York—W. A. Barrows.

Illinois State Dental Society—C. Stoddard Smith.

Indiana State Dental Association—S. B. Brown, M. Wells.

Kentucky State Dental Association—J. T. McMillan, H. J. Billing, A. O. Rawls, W. S. Moores, A. W. Smith.

Lake Erie Dental Association—W. E. Magill, D. G. Kelly, C. D. Elliot, F. Herrick.

Massachusetts Dental Society—T. Cogswell.

Mississippi Valley Dental Association—F. A. Hunter.

Missouri State Dental Association—W. N. Morrison.

New Jersey State Dental Society—C. S. Stockton, W. Pinney.

Odontographic Society of Pennsylvania—M. H. Webb, J. F. Flagg, L. E. Reading.

Odontological Society of New York—A. L. Northrop,.

Ohio Dental College Association—H. J. McKellops.

Pennsylvania State Dental Society—J. H. McQuillen.

Susquehanna Dental Association—Geo. W. Klump.

Tennessee State Dental Association—Henry W. Morgan.

Dental School of Harvard University—T. H. Chandler.

Philadelphia Dental College—D. D. Smith.

Ohio Dental College—H. M. Reid.

Miscellaneous business being in order, certain resolutions and amendments to the Constitution lying over from last year were taken up and acted upon.

The following amendment proposed by Dr. Shepard:

Add to article IV the clause: "The Executive Committee shall have power to change the place determined upon for the regular meeting for extraordinary reasons; notice of such change to be published in due season,"

was, after discussion, withdrawn by the mover.

The two following amendments, offered by Dr. Cushing, were carried:

Amend Article V, Section 6, under head of "Sub-Committees—First Division, —Committee of Arrangements," by striking out these words: "if practicable reside at or near the place at which the Association is to hold its next annual meeting, and shall"

Amend Article IV by adding this clause: "After the selection of a place of meeting, there shall be appointed by the President, annually, a committee of three, residing at or near the place selected for the next meeting, whose duty it shall be to procure rooms for meetings, clinics, and for the exhibition of mechanical appliances, and to make such other local arrangements as may be needed for the Association. This committee shall act under the direction of the first Division of the Executive Committee."

An amendment to Article V Section 1, proposed by Dr. Stockton, was laid on the table.

An amendment to Article III, Section 4, offered by Dr. Allport, was discussed by several gentlemen. Dr. Morgan offered a substitute, which, upon leave, was withdrawn subsequently, after which the amendment was adopted as follows:

Amend Art. III, Sec. 4, by adding the following:
This Association will hereafter receive no delegate, who shall, after this date, enter the profession without first having graduated at some reputable dental or medical college.

An amendment offered by Dr. McQuillen, increasing the number necessary to form a quorum, was lost.

The following resolution, offered last year by Dr. Bogue, was taken up and put to vote, and carried as follows:

Resolved, That it is the sense of this Association that no dental student should be graduated from any dental college without at least three years instruction, including private pupilage and college instruction; the latter should in no case embrace less than two full regular courses.

Another resolution on the same subject, offered by the same gentleman, was lost.

The following, offered last year by Dr. Judd, was, after discussion, adopted, as follows:

Resolved, That this Association recommends to all local societies the adoption of rules prohibiting their members from taking students for a less period than three years, or for such time as will complete a three years pupilage.

An invitation to visit certain objects of interest was accepted, and thanks tendered to the author.

A complimentary tender of the privileges of the floor was extended to Dr. Wilson, of Cuba, and any others from foreign countries who might be present.

The regular reports of committees were then called for, but those called not being ready, the Association adjourned till 7.30 P. M.

FIRST DAY—EVENING SESSION.

The Association was called to order at 7.45 P. M., the President in the chair. The minutes of the morning session were read and approved. The report of the Treasurer was read as follows, and referred to the Executive Committee:

WM. H. GODDARD, IN ACCOUNT WITH AMERICAN DENTAL ASSOCIATION.

August 5th, 1874.		
Dr. To Balance in my hands		$213 23
Cash Dues, for 1872	15 00	
" " " 1873	95 00	
" " " 1874	615 00	
		$725 00
August 5th, 1874.		
Dr. By paid Voucher No. 1	$100 00	
" " No. 2	213 98	
" " No. 3	120 00	
" " No. 4	511 35	
" " No. 5	250 00	
" " No. 6	14 15	
	$748 48	
August 3d, 1875.		
To Balance this day	$189 75	
	$938 23	$938 23

WM. H. GODDARD, *Treasurer.*

NIAGARA FALLS, N. Y. *August 3d, 1875.*

We have examined the Treasurer's Report and find it correct.

L. D. SHEPARD,
S. B. PALMER,
A. L. NORTHROP. } *Committee.*

The Committee on Physiology was called, but the chairman not being present it was moved by Dr. H. A. Smith that Dr. John Allen be invited to read a volunteer essay upon that subject, and the motion prevailed. Dr. Allen then read his paper, and closed by offering the following resolution, which was adopted:

Resolved, That a committee of three be appointed, whose duty it shall be to collect facts with reference to the subject matter here presented, and also the best means of preserving the physical and mental capacity of dental practitioners.

The chair subsequently announced Drs. John Allen, W. H. Morgan and W. E. Magill, as the committee provided for in the resolution.

The report of the Committee on Physiology was then read by the Chairman, Dr. McQuillen, and the subject being open for discussion, it was discussed by Drs. Atkinson, McQuillen, Magill, Flagg, Taft and Rehwinkel, after which the meeting adjourned.

SECOND DAY—MORNING SESSION.

The Association was called to order by the President; the minutes were read and approved.

The subject of Physiology was then resumed and discussed by Drs. Taft, Morgan, Barrett, McQuillen, Rehwinkel, Allen, Shepard, Flagg, and Atkinson, after which the subject was passed.

The rules were suspended to hear reports from the Executive and Publication Committees.

The Executive Committee recommended that the afternoons be devoted to Clinics. Adopted.

The Publication Committee submitted the following report, which was accepted:

The Publication Committee have to report, that in accordance with instructions contained in the resolution of Dr. Allport, adopted last year, they have had printed 250 copies of the Transactions of the last session, which have been bound in paper covers. They have been distributed to those entitled to them, and to the various journals of this and foreign countries, and about ninety copies now remain on hand.

The amount expended as per bills for printing proceedings and other printed matter, is as follows:

Printing Transactions		$212 00
Printing Postal Cards, &c		2 50
		$214 50
Postage, Express, Wrapping, &c		24 55
By Cash from Treasurer	$250 00	
" " Books sold	10 00	
	$260 00	
Balance in hands of Committee	20 95	
	$239 05	$239 05

Some complaint has reached the Committee in regard to the binding in paper covers only, the impression having apparently existed that the Committee bound them in this manner of their own choice. They beg leave therefore to call attention to the fact that that under the resolution already referred to, they had no discretion in the premises, but were confined to paper covers.

The Committee have also to say in apology for the somewhat late day at which the Transactions appeared, that the publication was conducted under peculiar difficulties, not liable to again occur. They would also say, that while the expense of publication was very low, considering the execution of the work and the quality of paper, yet the small number of copies ordered (250) makes the cost per volume much larger than it would have been had a larger number been ordered. For an additional sum, of say $50, the number of copies could have been doubled, and the price placed at 50 cents to 75 cents, instead of $1, as at present, and the Committee suggests for your consideration whether the dissemination of the Transactions by such a method, is not an object worthy of being aimed at.

C. STODDARD SMITH,
L. D. SHEPARD,
A. H. BROCKWAY. } *Publication Committee.*

Dr. Atkinson moved that the Publication Committee be instructed to publish 500 copies of the Transactions; but accepted an amendment to leave the number to the discretion of the Committee, and the motion as amended was, after discussion, carried.

A motion was made and carried, that in future the Dental Depots be requested to close their doors during the sessions of this body.

The regular order of business was then taken up and proceeded with.

There being no papers on the subject of Pathology and Surgery, that subject was postponed.

The Committee on Histology and Microscopy was called, and Dr. Taft, Chairman, read reports written by Dr. W. H. Jackson, of Ann Arbor, and Dr. E. D. Swain, of Chicago.

The subject was discussed by Dr. Atkinson, and the meeting adjourned.

SECOND DAY—EVENING SESSION.

The meeting was called to order by the President at the usual time. The minutes of the morning session were read and approved.

The subject of Histology and Microscopy was still before the Association, and was discussed by Drs. McQuillen and Atkinson. The subject was then passed.

The Committee on Chemistry was then called, and Prof. H. A. Smith read a report, which was discussed by Dr. Palmer, and the meeting adjourned.

THIRD DAY—MORNING SESSION.

The Association was called to order at the usual time by the President. The minutes were read and approved.

It was moved and seconded that one o'clock to-day be fixed for the election of officers. Carried.

Dr. Goddard offered the following, which was adopted:

Resolved, That the Publication Committee compile all the amendments passed since our Constitution was printed, and have not exceeding 1000 copies re-printed for the use of this Association.

Dr. J. H. Smith moved the appointment of a committe of three to prepare a resolution on the death of Dr. Asa Hill. The motion was carried, and the President appointed as such committee, Drs. J. H. Smith, Frank Abbott, and A. W. Harlan.

A resolution providing for the appointment of a committee to confer with a like committee of the American Dental Convention, in regard to the propriety of a joint meeting of the two bodies in Philadelphia next year, was laid on the table.

The subject of Dental Chemistry was then resumed, and discussed by Drs. Hunter, Palmer, Taft, Chandler, Osmond, Rehwinkel, and Daboll, and the subject was passed.

The subject of Dental Therapeutics was passed, there being no report presented by the Committee.

The subject of Operative Dentistry was then taken up, and Dr. Stockton read a report written by himself, and also one by Dr. McCall.

The subject was then discussed by Drs. Barrett, Taft, Atkinson, Abbott, McKellops, Rehwinkel, Morgan, and Rawls.

The hour for the special order, election of officers, having arrived, that business was proceeded with, with the following result:

President—A. L. Northrop, New York City.
First Vice-President—H. J. McKellops, St. Louis.
Second Vice-President—H. A. Smith, Cincinnati.
Corresponding Secretary—J. H. McQuillen, Philadelphia.
Recording Secretary—C. Stoddard Smith, Springfield, Ill.
Treasurer—W. H. Goddard, Louisville, Ky.
Executive Committee—(New Members) L. D. Shepard, T. L. Buckingham, M. H. Webb.

It was then moved and seconded that the action of this body in 1872, fixing the place of meeting in 1876 at Philadelphia, be ratified. Carried.

On motion of Dr. Goddard, the following resolutions were adopted:

Resolved, That the Treasurer notify all permanent members of their arrearages and of the necessity of paying the same.

Resolved, That the Treasurer pay the bills of the Committee of Arrangements and salaried officers.

The meeting then adjourned.

THIRD DAY—EVENING SESSION.

The Association was called to order by the Vice-president, Dr. Keely, at the usual hour. The minutes were read and approved.

by Drs. Atkinson, Taft, W. H. Allen, Stockton, Osmond, Flagg, Shepard, Abbott, Knapp, Butler, C. S. Smith, and Harlan, and the subject was passed.

The Committee on appliances made a supplemental report, which was received.

Dr. Abbott, after some informal discussion on the subject of appliances, moved that we have no clinics hereafter in connection with the meetings of this Association. After some further discussion, Dr. Atkinson moved to amend the motion by substituting the words, "that a vote of thanks be tendered to the clinical operators, Drs. Webb, Bonwill, Gaylord and Klump, who had added so much to the interest of the meeting." Carried.

Upon motion, the newly elected officers were installed, and Dr. A. L. Northrop, the President-elect, took the chair with appropriate remarks.

A vote of thanks was tendered to the retiring officers, and to Dr. Southworth, for the faithful discharge of their duties; also to the hotels for reduced rates.

Dr. Keely made a verbal report as Chairman of the Committee on the Barnum Testimonial Fund. He stated that the Committee had not been able to close up the business, as they had hoped, and requested further time, which was granted.

The President announced as the special Committee of Arrangements, acting under direction of the Executive Committee, Drs. McQuillen, Buckingham and Peirce.

Also as members of the Publication Committee, Drs. G. H. Cushing and G. C. Daboll.

Then, at 6 P. M., the Association adjourned to meet in Philadelphia on the first Tuesday in August, 1876.

In Memoriam.

WHEREAS, This Association has with sorrow learned of the death of our brother, Dr. ASA HILL, of Norwalk, Conn., therefore,

Resolved, That we signify in this public manner our sense of the great loss which the dental profession has sustained, and that we sincerely sympathize with his family in their loss.

Resolved, That these resolutions be inserted in our minutes, and that the Secretary be instructed to forward a copy of the same to the family of the deceased.

J. H. SMITH,
FRANK ABBOTT, } *Committee.*
A. W. HARLAN.

REPORTS

OF

STANDING COMMITTEES

VOLUNTEER ESSAYS

AND

DISCUSSIONS.

VOLUNTEER PAPER

ON THE

EXHAUSTIVE EFFECTS OF DENTAL PRACTICE.

By J. ALLEN.

IN taking a retrospective view of the dental profession, we find that our responsibilities and duties are increased in a corresponding ratio to the advances that have been made. Much more is expected of the dentist now than formerly, and his qualifications are required to be commensurate with the duties devolving upon him.

Without going into detail as to the various requirements of the dentist of the present day, I would say that there is perhaps no profession or calling more arduous, or that taxes the mind and nervous system more severely than a heavy dental practice; and it is often the case that the tension and exhaustive effect upon the brain of the operator is so great, that one hour of a pressure so severe as that to which he is subjected, tells upon him more than a whole day of ordinary toil; and yet he is often required to endure it for several hours in succession, or perchance for the entire day, and this is repeated, perhaps, each succeeding day of the week; and as with days and weeks, so with months and years, or while his health and strength hold out. His toil is often rendered doubly irksome by personal contact with patients whose nervous temperament exhausts his own vital force at a rapid rate.

by Orfila, Christison, Parker, Davis and others of the best writers and teachers on toxicology, as poisons, and are classed with arsenic, prussic acid, &c. They all have their places, and when judiciously administered to the sick, in small doses, act as mild stimulants and tonics, but in larger doses, as powerful irritants, producing madness, or as narcotics, producing coma and death.

Thus we find that the fourteen constituents embraced in the four classes of nutrients before named, are the proper materials for the construction and sustaining of the human body; and the Divine Architect was careful to employ not only just the kind of materials requisite, but also the due proportion of each constituent; and He also established certain physical and chemical laws, by means of which the nutrient substances, when taken into the system (in its normal state) are duly apportioned and appropriated to every part of the human organism, and thus the equipoise of waste and supply is maintained in time of health. But on the other hand we find that the additional materials introduced into the system by man's dictum, such as tobacco, stimulants, &c., are not nutrient materials from which cellular or fibrous tissues can be made or sustained; consequently they do not restore the vital forces which have been expended in the system in accordance with the laws of waste and supply, but serve only a temporary purpose.

Now in view of the facts here presented, we think a spirit of inquiry should be aroused in our profession, with reference to the cause of this peculiar fatality among our members. And first, is it owing to the exhaustive nature of our calling? Or, second, is it due to a course of habits, such as an excessive use of narcotics or stimulants, which an over-worked brain cannot withstand? Or, third, to a want of daily exercise in the open air?

We think the development of facts upon this subject will be productive of good results, and would therefore recommend that this matter be brought before the state and local societies, with a view of eliciting further information upon this subject, and in order to bring this question in a tangible form before this Association, I will now offer the following resolution:

Resolved, That a committee of three be appointed whose duty it shall be to collect facts with reference to the subject matter here presented, and also the best means of preserving the physical and mental capacities of dental practitioners.

[This resolution was carried (see minutes) and Drs. Jno. Allen, W. H. Morgan and W. E. Magill appointed as the committee provided for in the resolution. SEC.]

NOTE—After the reading of Dr. Allen's paper the report of the Committee on Physiology was read by the chairman, Dr. J. H. McQuillen. This paper the author declined to place in the hands of the Secretary at the time, and has not done so up to the time of going to press, (Nov. 16th) although it was promised two months before; nor have repeated letters and telegrams elicited any response from the author, although the committee have evidence that the dispatches were received by him.

C. STODDARD SMITH, Sec'y.

DISCUSSIONS.

DR. ATKINSON: I rejoice that we are beginning to attempt the solution of principles; but I regret that we are following the old lead of endeavoring to get at different conditions by a repetition of some of the phases of those conditions.

We have before us a very large and interesting question, and it assumes two forms. All we have had thus far has been a description of some of the results of the action that has been denominated on the one hand, sleep, and on the other hand anæsthesia. Sleep has not been defined before us; it has been assumed that we understand what it is. If that were so, we might have arrived at a proper understanding of the paper; but without such preliminary understanding we cannot arrive at a proper conclusion.

Shall I attempt to define sleep, to point out the line of demarkation between that and the waking condition? Were I to say it is simply a polarization or depolarization of the elements of tissue, how many would understand what I mean? They would want to know what polarity is, and whether there is any such thing as polarization of the currents of the human body.

We are dealing with something not quite so tangible as a stone fence, when we undertake the explanation of physiological action; when we are dealing with the manifestations of the power that lies behind all organic relation, and ascertaining the line between what we term normal activity as contradistinguished from abnormal activity.

There is resident within the human organism a demand for a sufficient quantum of power to operate the functions of the body. So long as that power is supplied in full measure to operate efficiently, we are in a waking state, and it matters little how much activity is indulged in, provided the influx of the power can be maintained.

Generally speaking, men dwindle down into individual experience to prove such conditions. I, myself, in the practice of medicine, have been able for a number of consecutive weeks to keep up the normal activity without sleep in the sense of retiring for regular sleep. I am also the subject of neuralgia, which I incline to think was induced by insomnia, producing such a strain upon the nervous system that it did not fully recover its tone, and it is now necessary for my health to be above the normal standard of the quantum of power in the organism not to have a consciousness of pain all the time.

What we denominate consciousness is to have our mental attention sufficiently in harmony with the deranged condition to cognize it.

The explanation of the physiological processes involved in this question, to any one not conversant with the laws of generation of tissues, is exceedingly difficult. I will not say the generation of tissues, but rather the generation of the elements of the tissues. That generation consists in oxygenation, and it involves also oxydation.

There are some of the activities which have been called vital and chemical, and a great deal of mis-nomination has been admitted into the scientific investigations of this subject, for want of seeing the foundation principles of the thing. That which we have nominated the science of chemistry and vitality, and chemico-vitality—these terms are simply inventions of fools, to enable us to appear learned, when we are as blank as midnight. We need to have a correct and intelligible nomination of the modes of motion, or the

conversion of the one generic vital power into its specific modes or correlations of force, so that we may apprehend with some certainty the steps we are taking in trying to ascertain what physiology is—that harmonious activity of all the organs, each perceiving its legitimate function, so as to constitute the rhythm of human life, of soul and body, in a consentaneous effort to fulfill the intent of its production.

To deny that the conditions of sleep and anæsthesia operate so as to disintegrate the blood corpuscles, is to manifest ignorance, but it is a matter too fine to come within the range of the coarse means of our perception. *Anæsthesia is death* in the ratio of its manifestation, every time. And now what is the difference between chemical affinity and privity of oxygen, as being the so-called cause? Oxygenation being really the organic activity whereby our tissues are differentiated, brings us to the point where we are able to say that if we have not the exact equivalency of oxygen present to produce any of the tissues, or protoplasm out of which the tissues are fed, we will fail to get the full measure of health. The final analysis of organic structure discovers nothing but blood and nerve matter. That which when vivified becomes a human being, is at first nothing but a neural mass, literally all nerve. It is through that refinement of relation, that satisfaction of the affinities of the atoms constituting this protoplasmic mass that we get fulness of endowment. Deprive this mass of the necessary amount of oxygen to enable it to differentiate all the organs of the body and you will fail of proper development. And so, in a sense, we may say that oxygenation, in the due equipoise of affinities resident in the protoplasm, does constitute perfect health, and anything short of that constitutes disease in the ratio of its presence.

This affinity that has been spoken of in regard to the double decomposition between nitrous oxyd and the elements of the human body is a mere assumption, and the idea of this being a supporter of combustion is another assumption, because it never does that until the bond of affinity between nitrogen and oxygen is broken, and the oxygen set free.

And now is anæsthesia sleep? It is a kind of sleep, but we do make a distinction between the two, and, also, as has been wisely

said, between sleep and death. And what is the difference between sleep and death? One is a depolarization forever and completely, and the other is a depolarization only in a partial measure and for a limited period. Do we sleep all over at the same time? No. If we did we should die. How does the heart get along and live without rest? Does it sleep? Does it have a period of rest?

Dr. McQuillen: The learned gentlemen ought to be aware of the fact that the blood corpuscles were formerly regarded as vesicles with fluid contents, but that they are now recognized by histologists as solid substances.

On being subjected to the action of ether, chloroform and alcohol by Sansom, they were disintegrated entirely, and finding that they were thus broken up, he therefore inferred that the same result would follow from the inhalation of ether and chloroform. My experiments upon men and animals, however, demonstrated that no such disintegration of the corpuscles ensued. This would seem to disprove the theory entertained by Sansom, that the blood-corpuscles being broken up could no longer carry oxygen to the nerve mass, and hence that anæsthesia would necessarily ensue from privity of oxygen. He believed it acted directly on the nerve mass as a poison. It would no doubt be consoling to the friends of the inebriate when they found him reeling through the streets to say, he was not drunk, but was only suffering from privity of oxygen. We are asked by Dr. Atkinson, "Does the heart sleep?" Yes, it does, and the lungs too. There is a period of repose, recognized by physiologists so far as the heart's action is concerned. This action is divisible into three intervals: 1st, the period during which there is a long, dull sound; 2nd, a short, quick sound; and 3d, a period of repose.

It is a difficult thing to define what sleep is. When we come to analysis; to a clear, sharp-cut definition, language fails us. So far as all the phenomena of nature are concerned we can only describe the phenomena we see. As to the producing causes, they are too subtle for our finite minds.

Dr. Atkinson: The gentlemen has admitted the truth of my remarks by the very illustration he uses of the condition of intoxication. That is only shifting the idea by a little witticism. It don't touch the matter seriously. What is alcohol? It consists of hydro-

gen and oxygen, the oxygen being in such small proportions as not to satisfy the demand in the system, and that deficiency is what causes drunkenness. It *is* the privity of oxygen, nothing else. Again very much of the nitrous oxyd in use is not nitrous oxyd at all. Now if in this there is a small proportion of any mixture not properly prepared chemically, then whatever amount of the nitrous oxyd is inhaled, that, coming in contact with a blood corpuscle does satisfy the affinity for oxygen.

Dr. Magill: I hoped the gentleman in carrying out the idea of his paper would proceed to some practical conclusions with reference to our profession. The tendency of the practice of our profession is to induce insomnia. Is this the result of nervous exhaustion or of mental excitement? I assume for the present that it is mental excitement, owing to the character of our operations and the intensity with which we are obliged to exert the brain for the purpose of arriving at certain results. I think we are all conscious of an exhaustion consequent upon the character of our work. Dr. Allen seemed to touch the subject practically. I think that if, as he assumed, insomnia is the result of over excitement—over stimulation of the brain, we should seek our remedy in a relief from such excitement; and I think one of the positions taken in the paper as to the question of sleep, whether it is produced by a determination of blood to the brain, or the absence or withdrawal of the blood from the brain, is a subject which it would be well to examine. I have noticed that Professor Buckland assumes that it is the withdrawal of blood from the brain. He cites the case of his father, who always after exciting brain labor, when he desired to procure sleep, ate a cracker, or perhaps a little piece of cheese, and retired to refreshing sleep. It is a simple remedy, and when we suffer from sleeplessness it would be well to supply the stomach with a little food, thereby withdrawing, for the time, the blood from the brain, and see if we do not get this result. I do not think as a profession we suffer from any one cause more than from this extreme excitement.

Dr. Flagg: I am entirely in consonance with Dr. Magill. Unless we can get something practical from these papers they are really as well unwritten. Sleep is a very extended subject to battle with. I have done a great deal of it in my time, and yet I feel totally incompetent to cope with the subject. It seems to me that our friend,

Dr. Atkinson, has struck the right chord. As much of his remarks as I could understand impressed me as being great good sense. If, therefore, what I could understand struck me so, I naturally infer that what I could not understand is greater good sense. Sleep is the desire for further life; the desire on the part of the animal economy to maintain life. In proportion as sleep is deep, strong and solid, just in that proportion is the recuperation. In proportion as it is short, slight and disturbed, in so far is it impossible to effect complete recuperation. If, then, sleep is such a restorative, it becomes a duty on our part as practitioners, in proportion as we become exhausted physically, mentally, and I might almost say morally, to go to bed early and not rise too early. Although I am no opponent of the progress of dentistry, yet I would earnestly urge my fellow practitioners not to get up at day-break and work with might and main at the chair all day, go to the laboratory in the evening and continue labor by lamp light, and then at midnight read up. I do not think dentistry will prosper so. My plan is to work at the chair a reasonable length of time, charge as unreasonably for it as I can, eat the best I can, and as much as I can, retire early and sleep long in a comfortable bed, and in a well ventilated room. I began this thing eight years ago, when I was flat on my back, weighing 122 pounds. Now, thank God, I am not perfectly flat on my back, and I tip 162 pounds. I will add to this my Saturdays. I see no one from Friday afternoon until the following Monday morning; and in doing this I feel that I am doubly biblical, for in the bible I am only ordered to rest one day in seven.

I think that sleep and anæsthesia are two different and distinct things. Sleep is life and anæsthesia is DEATH. Sleep is recuperative. I think anæsthesia in its proportion is DEATH, and that is a point I would like to make a practical one. I would stop this wholesale use of anæsthetics in the belief that they are harmless because they do not produce every time complete death.

Every time a practitioner places a patient under the influence of anæsthetics he places him in a dangerous position, if not to life, at least to health. He sows the insidious seeds of disease; sometimes only to the extent of a little unconsciousness, now and then; sometimes a perceptible and frequent inconvenience, and sometimes downright mania, or he produces chorea. I call to mind many in-

stances where patients have told me they never had a single indication of nervous trouble until they took ether; and that I consider the safest of all. From that time they had an uneasy sensation; at first an indisposition for food, then a certain stricture about the head, then an indisposition to reading, then a twitching of some one of the voluntary muscles, then a barking, then a clenching of the teeth, a condition worse than death. In this direction I speak as one in authority, having administered anæsthetic agents from three to five days a week for almost twenty years, and every time I do it I do so with a wholesome fear and trembling, lest with all my care a mischievous result may ensue.

Prof. Taft: I wish I could emphasize and make still more forcible the words of Dr. Flagg, for I concur with him entirely. It is a most serious subject. There is a large number of dental practitioners who are in the daily habit of administering anæsthetics, the greater part perhaps, employing nitrous oxyd, a less number using chlorform or ether. Now if the result which Dr. Flagg speaks of is liable to happen to the patient from a single inhalation or an occasional one, how is it with him who is constantly inhaling these agents in their administration by his hands a dozen times a day for a series of years?

I have known many instances where operators have been injured in this way; and in many instances of failing health in our profession; though other causes may doubtless contribute, this undoubtedly is a very frequent and a chief cause.

Another point in connection with the remarks of Dr. Magill, and that is in reference to the exhausting nature of our professional labors. That is not wholly due to prolonged effort, or to the peculiar character of that effort; but a large measure of that exhaustion is dependent upon the incompatibility existing between operator and patient. Now I think every successful operator will appreciate this. Many times an operation of an hour or two, for one individual, exhausts more than a whole day's labor over another. With some patients there is a constant drain, while with others there is an absolute increase of energy.

This is a consideration which I think should influence operators in their labor. For myself, I have for some years refused to operate for some patients, solely upon that ground.

Dr. Reihwinkel: I can bear witness to the truth of the statement of Dr. Taft, in regard to temperamental influences in producing depression upon the operator. I can also confirm, from personal experience, the remarks of Dr. Flagg, in regard to anæsthesia. Some twenty-five years ago, when I *served a term in the penitentiary*, I had learned to look upon chloroform as just as harmless as water. It was in 1848, just after its introduction. In these institutions the government gave instructions to test chloroform thoroughly. The instructions implied, if they did not expressly say so, that no responsibility would be attached to the administrator in any case. The object was to test this agent thoroughly, and therefore there was not the slightest operation performed without putting the patient under its influence. For six months during the winter of 1848 and 1849, I don't believe there was an operation at which I was not present. With such a familiarity with anæsthetics when I entered the practice of dentistry, I was not afraid of them more than of water. I used them during the early years of my practice freely, and two or three times I came near expediting a patient into the Happy Land of Canaan thereby.

As my dental experience grew, I became more cautious, and to-day I am not only cautious in their use, but I am afraid of them. In surgical cases, cases of great difficulty and involving much pain, their use is of course warranted. But in ordinary cases I have not given chloroform for ten years.

The instance occurs to me, reported by a gentleman of high authority and good standing, of a person of fine education and poetical tendencies, who accidentally read a poetical description of the charming effects of ether in stimulating a beautiful imagery. It struck him as the thing he wanted. He accordingly procured a quantity of ether, retired to his room, and put himself under its influence, His expectations were realized. His dreams were most pleasant. He saw the most delightful landscapes, and imagined the most delightful thoughts. He was desirious afterwards of repeating the sensation. He tried, but only partially succeeded, but he kept it up, and became a confirmed ether toper; gradually sinking in his condition; spending all his means to procure it. He finally got so low that he applied for admission to the charity hospital. Doubts were there entertained of the truth of his statement of

the enormous quantity it required to induce insensibility, and the most careful, thorough experiments were made to ascertain his condition. These experiments demonstrated that it took six and three-fourth ounces to put him only partially under its influence.

Dr. Taft: The discussion on this paper has turned upon the subject of health and disease in the practice of dentistry. I consider this subject of so much importance that it is at any time worthy of consideration at our hands; and any one will deem it so who reflects for a moment upon the fact that so large a number of our profession suffer in health from the direct influence of their work.

A few years ago there were scarcely any dentists in full practice who enjoyed good health. The last ten or twelve years, however, has witnessed a marked change in this respect. The occupation of the dentist is in many respects antagonistic to a good state of health. The confinement to which he is subjected is injurious; the positions of the body which it is necessary to assume, tend to injure the health. The work of the dentist, notwithstanding the common idea to the contrary, is of a very laborious character. In the first place it is physically laborious, but it is not so much the amount of strength he exerts as it is the strain required to hold a steady hand, to manipulate precisely and delicately, and to bring the operative or the executive powers to bear properly on living tissue. It is the nerve required to control and put forth a steady, persistent effort. This effort is not exerted by paroxysms, but it is a prolonged effort, running through hours, sometimes through the whole day. The surgeon, after the performance of a difficult and intricate operation, though it be of short duration, sometimes feels entirely exhausted, because of the intense concentration of faculties involved in order to perform so delicate and precise manipulation. Every one who has been engaged in the practice of dentistry understands very readily what is involved in all this. It is no wonder that the operator breaks down under the severity of the tension. When both physical and mental effort is put forth for a long time and in such measure, it is no wonder that health gives way.

Now we ought fully to recognize this, and so to regulate matters that this may be compensated for. The attention should be diverted from the objects of business as much as possible. The dentist should have something else upon which to put his attention; something

that shall promote both mental and physical recreation. His leisure moments should be spent in situations and under circumstances as different as possible from those which pertain to his every-day work. He should see to it especially that he has fresh air. And the matter to which I referred before, this matter of incompatibility between patient and operator, should not be disregarded.

Dr. Morgan: It will be remembered by some present that this subject attracted some attention in the Mississippi Valley Association years ago. Myself and another gentlemen who were present, offered an award of $200 for the best essay upon the subject of the peculiar diseases to which dentists are liable in following their profession, and the best remedy therefor. I apprehend that the diseases to which they are most liable are diseases of the chest, renal diseases, and hemorrhoids; and I apprehend that this is largely due to the constrained position they occupy.

The standing position enforces a severe strain, and I am glad to learn that many dentists have adopted the plan of sitting down. They thus avoid, to a great extent, that constant strain upon the muscles of the chest and shoulders which tends to press down the abdominal viscera, and bring about the troubles referred to. Some of the greatest troubles arise from the twisted position we assume in operating in a standing position, compressing the body in the region of the diaphragm, and producing an unnatural pressure upon the viscera of the abdomen.

In illustration of the idea advanced by Prof. Taft, that it is not the sledge-hammer blows which are so exhaustive, I might cite the fact that a man exercising with dumb bells, can sometimes raise with ease forty pounds, but if compelled to hold up one-fourth that weight for a length of time, he is completely exhausted. It is the persistent strain which causes exhaustion, and in the practice of dentistry we have that constant strain, mentally and physically, to an extent not equalled in any other profession with which I am acquainted.

I think in the arrangement of our offices too little attention is given to the matter of ventilation. Light, of course we are compelled to have, but if we could have more of the broad sunshine upon us than we do it would be still better. But in respect to air, great pains should be taken to secure the constant movement of a fresh current through our offices.

After I had been in practice several years I married and settled in the country, four miles from the city. I had a snug little farm and kept cattle and pigs and horses, and cultivated a garden. I left my office at four, five or six o'clock p. m., as circumstances permitted, and went home and occupied my time with the little concerns of my farm. After a lapse of two years circumstances drove me to the city to reside. In two years from the time of such change my friends regarded me as a broken-down man. I took the alarm, and procured myself a horse and buggy, and now when six o'clock comes, in the summer time, my horse is at the door, and the time until eight or nine I spend in exercise.

Dr. Barrett: The question respecting those patients with whom we cannot establish harmonious relations, is indeed one of much importance to the dentist.

We all know there is a great difference in patients. Some drain our nervous force, our vitality, as much in fifteen minutes, as others do in two hours. That, it seems to me, is one of the great causes why we are broken down as a class. We labor over those patients all day with whom we can establish no friendly nervous relations, and at night retire to our restless beds and toss uneasily through the night, awaking unrefreshed. What shall be done? I have patients whom I dread to have come into the office, so depressing are they. I have others over whom I can labor all day and yet feel comparatively vigorous and unwearied. There is no way of accounting for this fact upon known principles of cause and effect, and yet it is so. No more are we capable of discerning the distinction between life and death; between the living man and the dead subject. What is this mysterious thing we call life? We may give it a name, and add terms to our nomenclature concerning it, and after all we are no wiser; and we have at last to go back to the Divine word, where we approach, through its sublime simplicity, the nearest to an understanding of it: "And God breathed into man's nostrils the breath of life, and he became a living soul." It is a subtle question, and yet I think the time may yet come when we shall have discovered the laws governing the expenditure of vital force. Till we have done so we must go on and be robbed of it.

Dr. Taft: First impressions are sometimes unreliable, and a feeling of repulsion towards a person is not always to be trusted as indicating the nervous incompatibility of which I speak, but such is generally the case with me, and I trust it so far as frequently to make it a ground for a refusal to operate.

It has been said that our profession as a class are subject to insomnia. It has been my practice, if one night of unrest occurs to me, to institute a rigid inquiry for the occasion of it, and, generally finding it, I endeavor to avoid it in the future.

This general question of dental hygiene is an important one, and one to which I hope due consideration will be given.

Dr. McQuillen: I think this incompatibility is to a great extent due to the fact that the operator is not really in control of his case, his patient and himself. Learn to control yourself and your patient. It is said, that "he who conquers himself has conquered many cities." The case of Rarey, the horse-tamer, might be cited in illustration. His perfect self-control and coolness gave him the control almost at once over the most intractable animal. I hold that in like manner it is our duty as dentists to so control ourselves that we can control our patients. And this is effected not by being harsh and disagreeable, but through the exercise of personal magnetic power.

In relation to the theory of anæsthetics acting directly on the nervous mass: If privity of oxygen is the cause of anæsthesia, then sleep is caused in the same way by privity of oxygen. How are we to account for the prompt manner in which an anæsthetic acts on the nervous mass? How is it that nitrous oxyd in the course of a few seconds will produce complete insensibility? When we compress the carotid arteries, in the course of a few seconds insensibility ensues. Is it due to the privity of oxygen? A man accustomed to diving will remain under water at least three minutes, without trouble, and during that time he is not taking any fresh air into the lungs, and yet oxygenation goes on without interruption. In the respiratory effort all the air in the lungs is not expelled; we have what is known as breathing air—a certain amount thrown out and a certain amount taken in, but in a more forcible effort, what is known as complemental air is thrown off. By a still more forcible

effort what is known as reserve air is expelled, and even then there will remain the residual air, which the most powerful efforts will not remove, even when the lungs are removed from the body. The hydrostatic test for infanticide is founded upon this principle. If this be true, are we to say that anæsthesia is due to privity of oxygen? I admit that cutting off the supply of oxygen does interfere with the oxygenation of the nervous mass—does have something to do with it; but it seems to me reasonable to conclude that these agents act directly upon the nervous mass in producing the state of insensibility.

In regard to insomnia, that peculiar condition of the nervous system inducing sleeplessness, I will say that some years ago, when engaged in duties of a varied character as a practitioner, editor and teacher, I was obliged to rise early and work late in order to do justice to my several departments. In doing this I had recourse to such stimulants as coffee, etc., to keep the brain active in hours which should have been devoted to sleep.

This succeeded for a time, but it induced that nervous condition in which sleep will not come when it is desired. I could not sleep when I wished to do so. This condition is best remedied by exercise in the open air. The distribution of the blood to the various parts of the body thus induced relieves the congested condition of the brain. And here comes in an argument to the point that cerebral anemia, if not the cause of sleep is certainly a condition of sleep. We have that surcharged condition of the blood vessels of the brain. In respect to the matter of eating at night, there is a general impression that eating a hearty meal and then going to sleep at once is apt to induce apoplexy, night-mare, etc. It is true if one eats too much food, especially of an improper kind, and retires at once to bed, that the pressure upon the semi-lunar ganglion, or lesser brain, will induce such results occasionally; but I think that food of proper quality may be taken in moderate quantities without harm before retiring. In regard to the treatment of insomnia, much importance as a remedy is attached by Hammond to bromide of potassium. He says the use of this agent in doses of from 10 to 30 grains has, in his hands, produced remarkable results in relieving the congested condition of the brain, and soothing the nervous mass. We

have, however, the testimony of many good physicians to the effect that this agent is not so valuable for this purpose. I am not partial to the use of drugs. I believe with Holmes that if all the drugs in the world were in the bottom of the sea it would be all the worse for the fishes and all the better for man. If we can relieve insomnia by hygienic means it is best to employ them, and yet there are cases where hygiene fails. In such cases I believe that an occasional glass of lager beer serves a good purpose; at least I have found it efficacious.

Dr. Jno. Allen: I am glad to see that this subject is being taken up for consideration. I think it ought to have been done long since. The object in bringing it up in this manner was to excite a spirit of inquiry in our profession as to the cause of our being so broken down as a profession. I find in conversing with medical men, lawyers, etc., that the proportion of deaths in a state of insanity is far less in their several callings than in our specialty. There must be a cause for it. It seems to me, as I remarked in my paper, that the nearer we keep to nature's laws the better. Those laws are things which we can neither amend or annul. The Divine Creator has provided certain materials for the nourishment of our bodies, and has established fixed laws, physical and chemical, for their government. Our only way to the firm ground of health is through a study and observance of these laws. Stimulants will afford no satisfactory relief. Just so far as we elevate the system above its normal level by the use of artificial stimulants, just so far will it fall beneath that level in their absence. And again, the longer one persists in their use the more it will require to bring him up to the standard, because every time he falls lower and lower below the proper natural standard.

Dr. Shepard: I have been considerably interested in this discussion, and I would not say anything to diminish the interest in the inquiry with regard to what contributes to healthfulness in our profession. But I must say it has not been my experience to observe the tendency which has been spoken of as anything peculiar to our calling, at least to any such extent as has been inferred. We have still in our profession many old men in active practice. We have in Boston one gentleman who this week will be 75 years of

age, and who is engaged in daily, active practice. We have other men who have either just retired or are just about retiring, having secured a competency. There are several gentlemen in the neighborhood of 70 years of age in the active practice of dentistry in Boston. I will admit that they perhaps do not do as good work as the younger members of the profession. It is impossible, when a man attains that age, for his joints to be as flexible, his fingers as nimble and his back as limber as when more youthful.

As to insanity, there have been in Boston multitudes of men engaged in mercantile pursuits taken to the insane asylum on account of business perplexities, but in dentistry I do not recall an instance of insanity, although I have known many who died from paralysis and kindred nervous affections.

I think the large proportion of dentists enjoy a fair measure of health. The only reason why we see so large a proportion of young men in the profession is because twenty or thirty years ago our numbers were small. I question very much if dentistry is so destructive to the vital forces as has been stated. Over work in any calling produces its legitimate result, in dentistry no more than in anything else; and among those who have broken down within my observation, the large majority have done so manifestly from this one cause. One of our lamented fellow-laborers, who died a year ago, (Dr. Hitchcock), died simply from over work, laboring sometimes until three o'clock in the morning, studying microscopy and histology, and at the same time carrying on the duties of a large practice. The very day before he was stricken down by the disease which ended his life, he was at work until two o'clock at night upon an article for this Association, and with the fatal chill even then creeping over him.

The great secret of maintaining health is to enjoy our practice, to go to work with a zest, and yet not to overwork. Few appreciate how much a cheerful spirit of interest in our work conduces to health, and prevents the exhaustive drain which has been referred to. Incompatibility between patient and operator I grant does enter into the matter, but not to that extent which some believe, and the best counteracting influence to such depression is the cheerfulness and zest I have spoken of in the carrying on of our business.

Dr. Barrett: For my part I cannot avoid the conclusion that there is a greater drain on the vital force of the dentist than the practitioner of almost any other art or profession. The physician is not brought into such close contact with his patient as is the dentist. The lawyer pleading his cause of course exercises his brain severely, but there is not that nervous drain which the practice of dentistry involves. It is not the refractory patients that give us the trouble, but those who place themselves in our chair and settle down in a flaccid and passive state. Those are the ones who sap our energies.

Dr. Flagg: I rise in sympathy with Dr. Barrett. These passive, nonchalant patients most certainly do exercise an exhausting influence upon us, and it is certainly close contact which aggravates the trouble. I have sensibly diminished the bad influence by placing four or five thicknesses of cloth between myself and the patient. It is the touch of skin against skin, precisely upon the principle of the magnetic current, which causes it. Therefore, I do disagree with my friend, Dr. Shepard, and I believe that we belong to a calling which is exceedingly exhaustive.

He instanced several practitioners of venerable ages. I well remember my friend Gilliams, deceased now, who, when over 75 years of age, met me in Philadelphia and shook me heartily by the hand, saying: "Is that a good grip?" It was a good, vigorous grip, and he was a good practitioner, but then he was an easy going man, and they are the ones who last. Our vigorous workers, those who contribute to the resources of our art, and promote our science, are broken early, with, perhaps, some notable exceptions. This position I took years ago in a paper which I read before this Association: that the practice of dentistry calls upon its followers for a greater amount of power in every direction than any other occupation known to man. And that position I think I sustained. It is impossible for men to choose always the most congenial occupations, and no doubt there are many men in our profession who through unfitness fail of health as well as of operative success.

As to drugs, it is not the use so much as the abuse which makes them evils. And here I want to enter a protest against Hammond's advocacy of the bromide of potassium. My experience in its use may not, perhaps, be equal to his. It is at least sufficient to warrant

me in warning persons against its use. It is liable to leave a patient in a deplorable condition, and it is to be used always with the utmost caution, and in small doses. In the cases spoken of, as the result of many years experience, I should be inclined to choose in preference to any other the good, old-fashioned remedy of assafœtida. In cases of exhaustion from overlabor I do not know of any drug which is superior to this.

In regard to the question of sleep and anæsthesia, I recognize, with my friend, Dr. Atkinson, that we cannot see all the subtle workings which go on in the animal economy, but I think we should carefully distinguish sleep from unconsciousness. There is a great difference, and I am going to try to make the point that sleep is a recuperative action, while unconsciousness is an entirely different thing. We have heard arguments advanced to the effect that in sleep we have turgesence of the blood vessels, and assertions have also been made to the contrary. For my part I believe that in sleep proper, we have not that condition. Pure sleep is usually characterized by a slight paleness of the skin. Unconsciousness is generally marked by flush and fever. Nor do I think that in pure sleep it is a sleep of the molecules here and there, of one part and then another.

Unconsciousness, unlike sleep, is marked by turgescence of the blood vessels of the brain, and in the unconsciousness produced by disease there is a condition analagous to that termed anæsthesia. Pure sleep is always refreshing, but in anæsthesia the person awakes unrefreshed. It is abnormal in its effects. A young gentleman was once sent to me who was afflicted with a dog-like snapping of the jaws in chorea. Upon questioning him as to how long he had been in that condition, he replied that it had been years gradually coming upon him, and further inquiry traced the trouble to the administration of ether years before. It was only a stone added to the monument, as high as Bunker Hill, of the evils so wrought. And yet I regard anæsthesia as a boon to humanity, and one of the most valuable contributions to medical science. The difficulty is in the want of knowledge as to its proper administration. We have recently been visited in this country with a very destructive insect known as the potato bug. It has been suggested, for the purpose

of destroying it, to use a little arsenic mixed with a good deal of plaster. They tell us there is so little that it can do no harm; but put a bug into the arsenic; does he eat it? Not he. The poison is absorbed by the leaves and the destruction of the bug is caused by his eating them. And it is precisely because a small quantity is used that it is dangerous. Would you put a minimum of arsenic on a cancerous tissue, or would you not rather make a strong paste? The more arsenic you use the safer. And it is exactly so in the administration of anæsthetics. What is the condition of the patient when he is a little bit insensible? Every sentient nerve is raised to its utmost degree of sensibility; every sense of feeling is exquisitely refined, and patients frequently say that in that condition they experience the utmost torture in being operated upon. I believe in the administration of ether in overwhelming and extinguishing the consciousness. You will find in giving ether that the first sense to be affected is the sense of smell, and the anterior portion of the brain is the first to succumb. And in the administration of an anæsthetic the most critical stage is this partial condition of insensibility, just when the patient is being carried over the *pons variolii* to the induction of anæsthesia upon the medulla oblongata. When we affect these special nerves until complete insensibility ensues we have instinctive winking, and when you have carried the patient safely over that bridge, though we still have the power of winking, it is not instinctive, and you have reached ground where you may safely operate.

Dr. Atkinson: It seems to me absurd for us to go on citing examples of our personal experience which explain nothing, but simply show how these beautiful presentments of physiological law affect our minds. We say a great many things which have no argument in them at all. There is a stern earnestness in nature. There is a deep truthfulness in these subjects which ought to engage our highest powers, rather than always fluttering in the breeze of expected applause at the beauty of our own well turned sentences and fanciful conceptions of the modes of motion and the agencies which act on the organism we call the human body.

All that has been said of nutrition has been referred to motion of the blood, but even the astute minds of our Philadelphia professors

are astray when they tell us that it is not oxygenation and de-oxygenation which is the real point of expression of the turnings of these currents which we call nutrient currents; in other words, that polarization and depolarization of the elements of the tissues is not immediately affected by the presence of oxygen. Besides the constant supply of oxygen to the system in respiration, this mass of protoplasm is charged with it, and that supplies tonicity to the parts. There is a store of oxygen still kept in reserve, and within the reach of the little agencies which order it to take its place. When this supply is exhausted the system is dead, and there is no means of its restoration. So long as this protoplasm which supplies the tissues is charged to the satisfaction of the bonds of affinity of the substances making up the tissues—so long as that is kept up to a certain degree of tension of its currents, it is capable of being depolarized by the presence of oxygen. And it is the reversal of these currents that constitutes the difference between nutrition and de-nutrition—between the building up and the breaking down of the system.

Dr. Taft: I want to make a correction of an impression which seems to be in the minds of some in respect to what I said on the subject of incompatibility between patient and operator. I did not mean that state of irritability sometimes manifested by a patient towards the operator, but I meant something deeper than that, something more hidden. You will oftentimes find the condition to which I refer existing in a patient in whom there is no irritability; where they make no manifest opposition in any respect. Dr. Barrett struck the idea when he said that the most incompatible persons are those of sluggish, unresisting temperaments. There is something about them which is repulsive to the operator; a repulsion on one side or the other, possibly mutual, but rarely mutual, because a patient having a strong repugnance would not put himself or herself under such charge. But with the operator it is not so. Whatever kind of patient comes to him asking his services, he feels as though he must treat them. The irritable patient may be dominated and controlled, but the other condition is beyond our control. Do not entertain the idea that you can dominate such cases, for if you try to do so it will only increase the exhaustion attending them.

REPORT

ON

Histology and Microscopy.

By W. H. JACKSON, of the Committee.

(Read by Prof. Taft.)

In making microscopical investigations of the structure of hypertrophied cement, I was struck by the frequency with which atrophy is found in connection with it. By this I do not mean the action that accompanies ulceration, which is simply a chemical action upon dead tissue. There seems to be constant changes in the intensity of each of the two opposing vital forces (absorption and resorption) at work in the system. Absorption takes up and appropriates whatever materials may be necessary for the perfection of the structure. Resorption removes all portions that have become old or useless. When the system is in a normal condition, the one balances the other, but let the one gain the ascendency from some abnormal condition and we have hypertrophy in all its forms, rapidly building up tissue beyond its normal size; but with the other we have as rapid tearing down of the tissue and the carrying of it off as excremental matter. I would call your attention to the frequent alternation of the ascendency of these forces; for through

these excessive and rapid changes are we able to prove that the osseous system may be constantly changing or renewing its tissues or that large portions of it may be removed and again built up, the same as in the soft tissues, though the change may not be quite as rapid. It may be said that the enamel does not change, yet no observing dentist will deny having filled teeth that were soft and tender, and years after found the same teeth hard and strong.

In examining hypertrophied cement we find it is frequently laminated, showing that there are times of great activity of absorption, followed by almost if not entire cessation of activity; also that there are places of greater intensity of action, causing the laminæ to be thicker in some places than in others. Often there may be observed a line, like the ripples upon water, running in the same direction as the laminæ, here and there dipping down into the lamina beneath, like the deeper trough of the larger wave among the ripples; this line shows to what extent resorption had taken place before absorption began again to carry on its work.

I have specimens in which the resorption penetrated the hypertrophied and true cement and far into the dentine, but absorption stepped in and the hypertrophy is greater than the original size of the root.

During these investigations many ideas came to mind for consideration, and I will give you the benefit of a few:

First: I noticed that in laminated hypertrophy the cement or bone corpuscles were most numerous at the beginning of each stage of activity of growth, having broad, flat bases, with filaments reaching toward the periphery of the laminæ; also, that they are larger and more numerous at the points of most rapid growth.

Queries: Why should this be the case? What function do these corpuscles fulfill? Are they analogous to bone corpuscles? Are the corpuscles necessary to the physiological structure of true cement? If they are necessary, why are they absent or wanting in the cement of some teeth? If not necessary, is their presence in true cement the result of a pathological condition of the cement organ at the time of the formation of the cement? May not these corpuscles be nothing but fragments or masses of periosteal tissue enveloped in the rapidly developed cement? I am inclined to

answer the last query in the affirmative, although I shall not take a positive stand until I make further investigation, as nearly all histologists are against it.

There is too little attention paid by the profession generally to the study of the minute structure of the teeth. A careful, thorough study of it would prevent many permanent injuries to the nerve, and many aches and pains arising therefrom. We should work with exceeding great caution in excavating cavities in the incisors, as very often quite large filaments of the pulp extend far into the dentine. I have specimens where these filaments extend through the dentine; one of an inferior incisor slightly worn on its cutting edge, but at three points the nerve was exposed, causing its death and the loss of the tooth. Several other teeth in the same person's mouth gave evidences of a like structure, and the nerves will probably become exposed in the same manner.

In examining the transverse grooves often found on teeth, I find they have two distinct characters. The first class, those which have rounded sides, are undoubtedly formed during the development of the teeth, and are caused either from pathological conditions of the primary dental organ, or from varying intensity of action of the dental organ during the formative process.

The second class, where the sides are hollowed out, uneven or ragged, are the results of chemical action of the secretions of the mouth at different stages of growth of the tooth after it has cut through the gums.

Thus it will be seen that there is a marked similarity between the first of these conditions and hypertrophy, both assuming rounded borders. Also a greater similarity between the second and the result of resorption, both being hollowed out.

Prof. Stricker, of Vienna, has been making some very interesting investigations on the pathology of suppuration, published in the December number of *Stricker's Medizenische Jahrbuch* for 1874; also a short notice of the same by D. J. Hamilton is found in the April number of the Quarterly Journal of Microscopical Science, 1875. He arrives at the following conclusion: That pus corpus-

cles are formed by fissiparous division of the cells of the injured or diseased tissue, and not collected from the circulation. Also, in the same number of the Microscopical Journal, are described the results of examinations by P. Kidd and Dr. Klein, of the ciliated epithelial cells from a frog's mouth. These observers noticed amœboid movements in certain cells, the nuclei of which seemed to move spontaneously.

ADDITIONAL REPORT

ON

Histology and Microscopy.

By EDGAR D. SWAIN, OF THE COMMITTEE.

(Read by Prof. Taft.)

Your committee upon microscopy and histology have to report but little new under this head during the two years past. In fact, the past year appears to have been one of decided barrenness in this direction, especially so when compared with the three or four preceding years, during which time there were added to our literature the publications of Wedl, Ball, C. S. Tomes, Salter and others, all containing more or less upon the histology of the dental tissues, and settling for years, perhaps, some of the questions which have troubled students in this direction for a considerable time.

During the last year articles have appeared from the pen of Dr. H. S. Chase, of St. Louis, in the *Missouri Dental Journal*, setting forth certain new theories regarding the histology of dentine, illustrated by cuts, showing certainly an unusual appearance of such structure.

Much unkind criticism has been made upon the theories of Dr. Chase, and incredulity expressed as to the correctness of his illustra-

tions. Your committee, not feeling disposed to condemn unheard any man, and feeling that all had not been discovered yet as to the matters advanced by Dr. Chase, determined to investigate the subject as fully as possible for themselves, and, if anything was discovered to justify it, to embody the results in this report. The investigations of your committee do, in their judgment, warrant a statement of the facts here, and a brief discussion of the theories suggested.

Your committee examined the specimens or preparations in company with Dr. Chase, of St. Louis, Prof. H. A. Johnson, of the Chicago Medical College, one of the best histologists of this country, and Prof. I. N. Danforth, of Rush Medical College, also a histologist of high repute.

The preparations unquestionably presented the appearances delineated in Dr. Chase's drawings, though not quite to the extent there shown. The bead-like appearances were well defined in the *tubuli* of quite a number of the specimens. These appearances were apparent to all the observers, and the number of specimens showing them, claimed by Dr. Chase to be from different teeth, was quite large.

Prof. Chase informs your committee that all the specimens showing this baccated appearance of *tubuli* were from teeth extracted from persons not over seventeen years of age, and before full and complete development had taken place. He advances the theory that the dentinal cells have placed themselves in linear arrangement, and that the proximal ends have united, the cell wall at the point of union being absorbed, and by a continuation of this process dental *tubuli* are formed. Further, he advances the theory that the nuclei of the cells still remain in the calcified cell walls, and that they retain the vitality necessary for action whenever the proper conditions exist; and further, that it is through the renewed action of this cell power that the vital actions claimed by him in fully organized dentine do occur; for instance, as the absorption of dentine from beneath a perfect gold filling to such an extent as to unite the cavity of decay with the pulp cavity. In other words, Prof. Chase claims that "the two opposite processes of calcification and decalcification may and do take place in the perfected hard

tissues of teeth; and furthermore, that the basal structure itself, or the animal portion of dentine, may be removed without chemical action." (See page 108 Transactions Illinois State Dental Society, year 1873).

Now what Dr. Chase has seen is undoubtedly there, and the appearances are not due to any imperfection in mounting, nor to peculiar modes of preparing the sections. But these appearances alone do not establish the theory advanced by him. Analogical reasoning proves his established observations, and facts might justify his conclusions, but his theory cannot rest upon a sure foundation or be considered as established until he shall be able to fortify his position by demonstrating (by use of reagents) the presence of the nuclei within the calcified walls of the assumed cells.

Attention was called to the appearances observed and demonstrated by Prof. Chase, by John Tomes, in a course of lectures upon "Dental Physiology and Surgery," delivered at the Middlesex Hospital School of Medicine in 1846. The lectures were first published in the *Medical Gazette*, and were revised and published in book form in 1848.

I will quote from his lecture on the formation of dentine as much as is parallel to the theory of Prof. Chase. He says: "The component cells acquire a linear arrangement, those nearest the surface being the first to take this position. These so-formed columns are nearly vertical with the coronal surface of the pulp, and lie parallel to each other, holding the same relative position among themselves as do the dentinal tubes; each cell, after falling into line, divides into two or more in its length, and each division elongates. A central space or nucleus is seen in each cell, which lengthens with the cell. The cells, by their increased length, become placed end to end, and ultimately unite; the elongated central space of each individual, by further development, joins and opens into those of the superimposed cells, thus forming a central tube common to the lineally united cells. At about this period of development the earthy matter is received into the tubular and intertubular tissue, in other words, dentine."

Mr. Nasmyth considered what Tomes described at this time to be baccated fibers, and not tubes. Mr. Tomes explains that the bac-

cated appearance arises from the individual pulp cells, which have by their union, contributed to form the tube, preserving the convexity of their centers and at the same time preserving a constriction at the point of junction. So the baccated appearance may be regarded as an arrest of development.

Again he says, on page 75, regarding the disposition of the nuclei: "It would seem, when tubular tissue is required, the tubes are formed by a linear confluence of cells. The *nuclei* and opposed surfaces disappear, thereby leaving a tube, the axis of which is the former axis of the cells."

It will therefore be observed that Profs. Chase and Tomes only differ materially as to the disposition of the nuclei of the cells, a question of the most serious importance. Should the theory of Prof. Chase, however, be correct, dentine becomes invested with new and important features.

Prof. Chase is engaged in a field of investigation never before so thoroughly traversed, so far as your committee are aware; and what he has seen certainly cannot but suggest theories somewhat in conflict with those generally adopted, and stimulate truly scientific men to the most thorough investigation of this subject. Dr. Chase is entitled to great credit for his untiring labors, which have thus far extended to the preparation of five hundred (500) specimens. He proposes to prepare five hundred more, from diseased teeth. Such investigations cannot fail to be of great value; and if he fails to reach the truth through them, he, at least, furnishes material from which it can be worked out by other minds.

A very interesting case of dentigerous cyst has recently come into the hands of your committee through the kindness of Dr. Goddard, of Louisville, Ky. The history of the case is something as follows: A lady, aged twenty-three years, called upon one Dr. D. M. Morse, of Richmond, Ky., for the purpose of having her teeth extracted preparatory to the insertion of artificial substitutes. The deciduous right cuspid was still in its place. After the extraction Dr. Morse observed an enlarged condition of the alveolus; supposing that either the permanent cuspid was in the jaw not erupted, or that the deciduous root had parted, he carried

his alveolar forceps well up, and outside the enlargement, and cut through; removing the same, his attention was arrested by the peculiar appearance of the mass in the blades of the forceps. Upon examination he was not a little surprised to find instead of a cuspid tooth, or the root of the deciduous tooth, that he had extracted *sixteen miniature cuspid teeth!* The floor of the cyst, upon examination, revealed the sockets of several of these small teeth.

The young lady informed Dr. Morse that the right permanent cuspid had been extracted several years previous by her physician, (with hammer and spike!) and that it came in as a tusk (so called). Several days later she exhibited the cuspid so removed, which Dr. Morse reports to be a right cuspid, and a perfect tooth.

Cysts of this character are by no means common, and are therefore fraught with considerable interest to the profession. A few cases are reported by Chas. S. Tomes in his latest work upon "Dental Surgery." One case only is reported by Wedl; and as neither these or other authors have given us the microscopical appearances of the teeth, your committee deemed it worth their while to devote a little time and attention in this direction. The results of the microscopical investigation by the committee are submitted to you in the photographs prepared for it by Dr. Oliver of Chicago.

The question arose in the minds of your committee whether these nodules, having the outward appearance of teeth, and all of one type, were really teeth; whether they possessed the histological peculiarities observable in tooth structure. We find them to be perfectly developed teeth as to enamel, dentine, cementum, and containing a pulp cavity.

Tomes gives no theory as to how such phenomena could be produced. Wedl informs us that Nelaton declared them to be multiple tooth formations in one alveolar socket. Broca, he says, modified the declaration so far as to say that they were not developed from so many tooth follicles, but originated in a division of the primary tooth germ. This appears to your committee the most reasonable explanation.

It is an undisputed fact that cells do sometimes assume an abnormal activity, as in cases of tumors, and multiply themselves to a wonderful extent. It is probable that the primary tooth germ by gemmation produced sixteen daughter-cells, and each of these

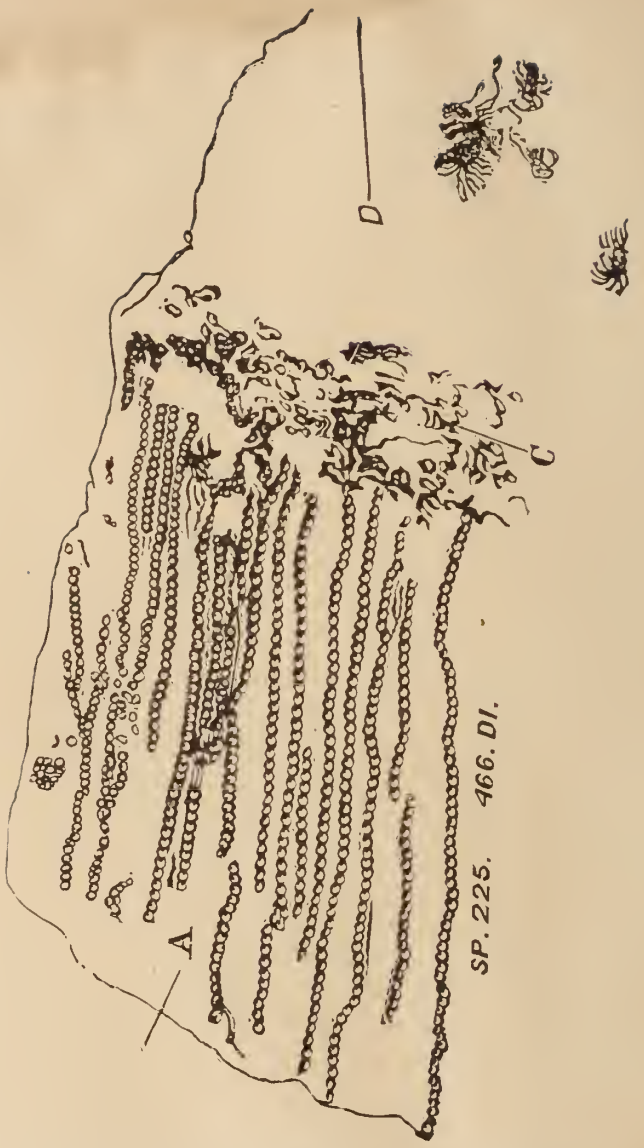
daughter-cells has given us a tooth in miniature. Thus we have the sixteen teeth all belonging to the same type. As the primary cell of a cuspidatus is able only to produce a cuspid tooth, following the physiological law governing the growth of cells, we came to the conclusion that the mother cuspid cell could only produce cuspid cells. Cell genesis always preserves the type of the mother cell.

It is asserted that three-fifths of all abnormal growths present no new type of cells; if it be a fatty tumor the cells are fat cells unmistakably. Equally true is this of all other abnormal growths depending upon cell development.

The inquiry arises, why have we not then sixteen full sized teeth? The only reply we can suggest is that the power of a new cell to develop tissue of any character depends upon the power or capacity to assimilate new material of the kind necessary to produce any tissue. This law may account for the miniature size of the teeth usually contained in cysts. The variation in size may perhaps be accounted for upon the ground that the larger teeth were the first daughter-cells developed, while the smaller ones were developed by younger cells borne by the mother cell when there was less activity, or when, perhaps, the mother cell had exhausted herself by the over amount of work already performed.

Your committee are aware that in thus speculating upon the physiological possibilities regarding the development of cysts they have stepped outside the matter assigned them. They, however, believe the subject invested with sufficient interest to warrant the step taken.

The subjoined cuts and photographic illustrations are submitted with the report. The wood cuts, A, B and C, are illustrative of the investigations made by Prof. Chase; the photographic illustrations, which were prepared by Dr. Oliver, of Chicago, refer to the dentigerous cyst described in the report. Explanations of each illustration will be found in connection therewith.

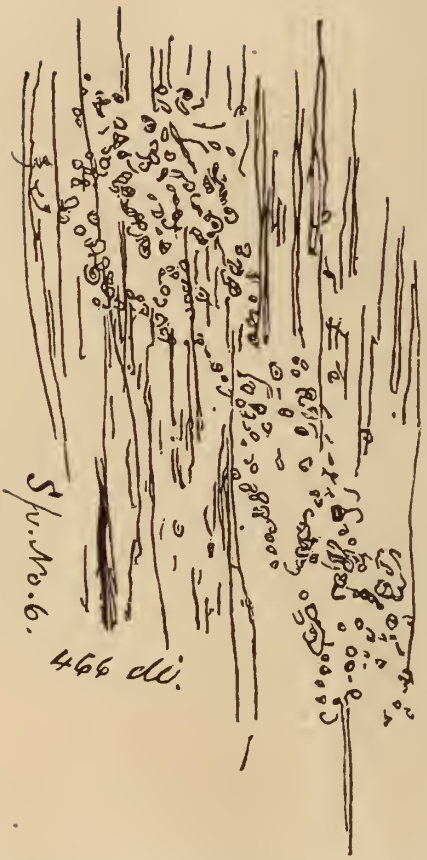


CUT A.

Field of dentine from root of permanent upper second molar; boy aged fourteen; end of roots not quite finished. Tooth not decayed. "A." This and other clear spaces are occupied by dentinal tubes, which are here omitted the better to show the cellular appearance of the dentine. The rows of cells seen in the cut can be resolved into a continuous dark line without the appearance of cells, by a different focus of the microscope. "C." The irregular cellular territory between cementum and dentine. "D." Field of cementum indicated only by a few cementum cells. Magnified 466 diameters.

CUT B.

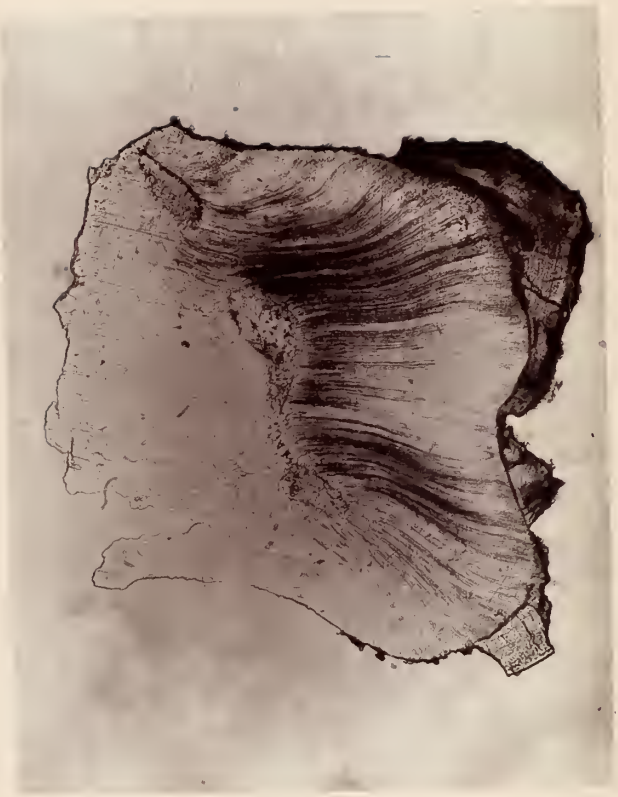
Specimen No. 132. Cross section of root near end, from a decayed under bicuspid. 17 years old. Magnified 200 diameters.



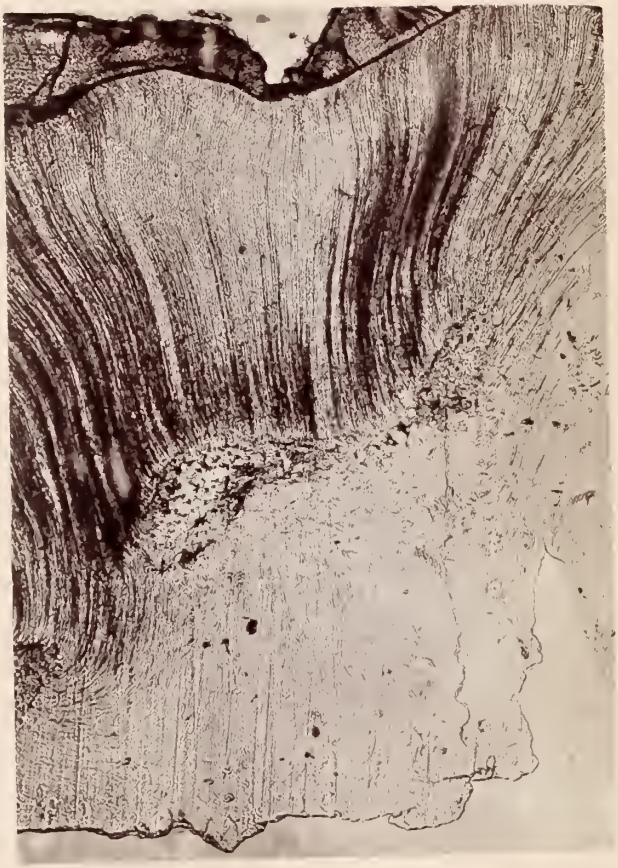
CUT C.

Specimen No. 6. Magnified 466 diameters. Longitudinal section of crown from under central incisor, 65 years old. Tartar on neck. Roof canal closed for some distance by new formation. Extracted on account of pericementitis. Undecayed. Cellular appearance in dentine territory.

No. 1. One of the teeth of the dentigerous cyst described on p. 57, full size, magnified 200 diams. by a 2 inch objective. The root of this tooth was not fully developed, though it will be observed that, so far as developed, it is a perfect tooth, anatomically and histologically.

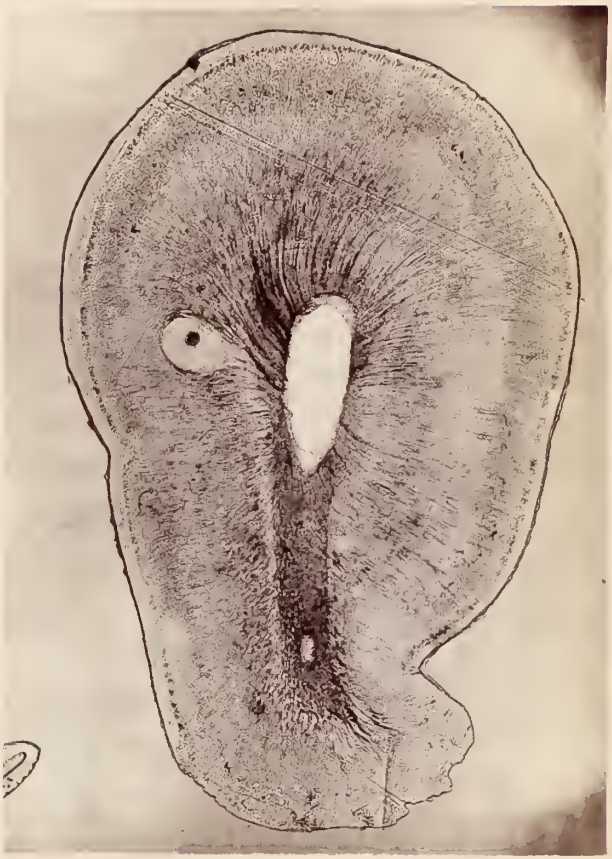


No. 2. Full crown of a partially developed tooth, similar to No. 1, and showing a similar completeness of histological characteristics. 16 diams.



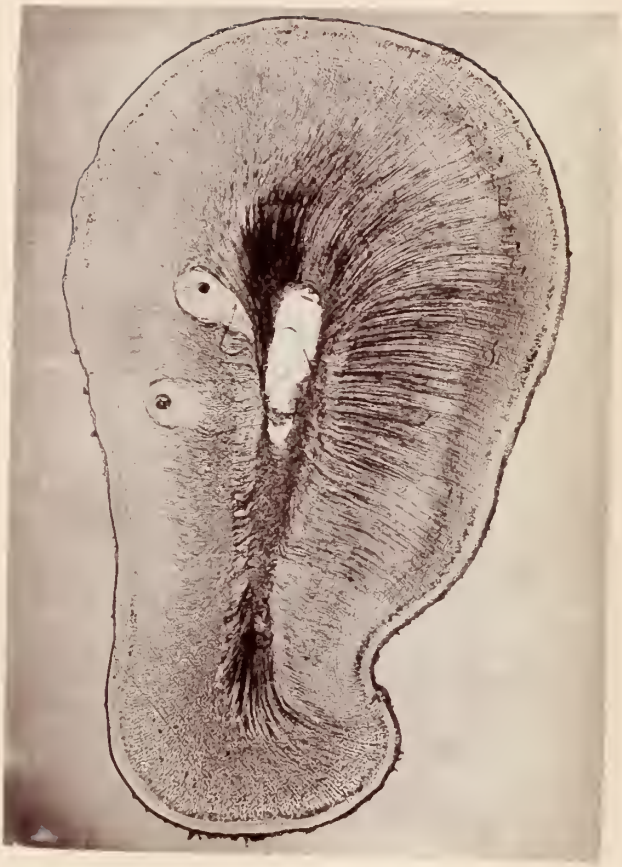
No. 3. Pulp chamber of specimen No. 2, showing formative cells, some of which are shown in this specimen as budding or dividing by the "dumb-bell" process. 40 diams.

No. 4. Part of the crown of another of these teeth, from one side of the pulp canal, and midway between the canal and the cementum, showing calcified remains of a capillary. 22 diams.



No. 5. Transverse section of No. 4, cutting across the capillary. 25 diams.

No. 6. Transverse section of capillary shown in Nos. 4 and 5, enlarged to 50 diams.



No. 7. Transverse section of tooth shown in Nos 4, 5 and 6, cut through the loop of capillary 40 diams.

No. 8. Section of No. 7, magnified 50 diams. showing transverse section of loop of capillary, and formative cells in pulp cavity.

No. 9. Section of same tooth shown in No. 7 and 8, but from the opposite side of pulp cavity. 20 diams.

These illustrations are from micro-photographic negatives prepared by Dr. O. C. Oliver, of Chicago, reproduced by the American Photo-Relief Co., Phila.

DISCUSSIONS.

DR. ATKINSON: I am very glad that this subject is brought before us, and I hope it will be thoroughly discussed. I only took a few notes on the last paper, and will speak with regard to this dentigerous sac that is called the product of a mother cell of a cuspid tooth, and assumes that that cell was divided up into a number of darling little daughters just like herself. Such a conception as that is not well grounded. If we know anything about the formation of teeth, we know there are teeth which are mere filaments, of a fibrous character, simply little corneous substances; and yet they are as legitimately teeth as the most complicated organizations we meet with in tooth structure. What is the law of development here? There may be filamentous teeth, or single denticles, or there may be many denticles together, so that you will have multicuspid teeth. All these have a type which resides in the original papilla, which becomes the pulp, or the pulp contained within the sac. That is the precursor and necessary foundation of the development of all teeth. And in the classification of teeth, why is it that we have cuspids, and incisors, and bicuspids, and molars, and tricuspid, and multicuspid teeth? They grow out of the alternation of generation of a certain series of cells, so called. And these cells, *per se*, by their very nature are endowed with the ability to classify, to lay down the line of development after the manner of crystallization in the mineral kingdom. They are formed in a bed of animal matrix, and this is characteristic of enamel cells. Those cells, if not calcified, could not be differentiated by five men in a hundred as enamel cells. We only judge of them after they have completed their work. But we can make a correct classification only by going back and examining these cells in their soft, plastic condition. The proof of this requires the observation of a number of specimens of enamel rods in the different stages or degrees of calcification. The end of the rod calcifies nearest the pulp; calcifies first by the deposition of

lime salts, converting the cell into the first section of the rod. This may be fully calcified: the next cell may be half calcified and half uncalcified; and the next cell holding lime salts in solution, but not yet granulated so as to indicate their presence. The next cell will be slightly modified from the cuboid form, and the balance of the cells that are the elements of the enamel rod will be younger and younger until we come to the peripheral end, which is represented by a cell like a collapsed epithelial. The whole enamel is but an accumulation of these, side by side. The pulp is composed of blood-vessels, nerves, connective tissue and protoplasm, and hence is an organ, not an element.

And now no man is entitled to classify teeth who has not seen their inception, their growth and multiplication, so that, the alternation of generation of cells being completed, we are enabled to clearly understand the series nature has ordained.

There is a whole series of cells. There are muscular cells, and connective tissue cells, and there are cells constituting the soft tissues; and in the tooth there are cells whose office it is simply to harden the other forms of cells. We have already delineated a series we call enamel cells, and we have another series called dentinal cells; and then we have a compromise between the enamel and the bone, denominated cement cells. These are all different stages of development, but they come into existence by one birth. When the pulp was soft the limitation of possibilities under the enabling circumstances was set, and by that alone we can classify those teeth.

Going back and improvising, and inquiring into the cause of this or that form, and nominating them all cuspid teeth, is utterly profitless. It is by the law of the feeding of these cells that we get any of these tissues, but it is not yet known what the limitation is as to enamel, dentine and cement.

Now, in relation to hypertrophy of cement, the paper says the remnant of a cell is—what? Connective tissue enclosed in lime; and they accounted for a cement corpuscle in that way; but we know that it is the uncalcified tract of the cement cell, just the same as the fibrilla is the uncalcified remnant of the series of cells that originally formed the tubule in the dentine. We are dealing with various classes of cells, but not in the order of mother, daughter and grand-daughter, because they are all of the

same birth, but grow to maturity with different degrees of rapidity, according to the enabling circumstances. In chemistry we have synthesis and analysis, or togetherness and apartness; that has hitherto been confined to the azoic or inorganic kingdom, and that is why they make a misuse of the term chemistry. There is a chemistry to every substance, however coarse or fine that body may be. Complete expression of togetherness comes under the dominion of crystallization. Crystallosophy is a compromise between that and the looseness of holding which gives us the vegetable kingdom, which is cellulation. And we have another stage of togetherness, which is denominated crystallosity, or soft-solid bodies, which is the basis of the animal kingdom; but you get no vegetable thing, or the substratum even of a disintegrated mineral upon which to base this form of being, and you get no complete or chaotified condition of the vegetable kingdom out of which to get your animal kingdom; but we find when the human body is completely solidified that it is remanded to the domain of crystallosity, or most dense togetherness, or closest synthesis. That is the mode of its nourishment. But when we come to the vegetable we find that it holds together only loosely so long as there is vibratory or breathing motion, assimilating that which is best for its development and throwing off that capable of being remanded to the law of crystallization. As we rise in the scale of being, we see that there are tissues kept in a changeable state in soft-solids, and when their elements are unfit to fulfill the duty of constituting the filaments of tissue, they are dissolved and remanded either to solution or deposition, that which is capable of making new protoplasm being taken up and appropriated to new uses in the system. Now, what is the nutrition of the teeth? The nutrition of the enamel is the nutrition of crystallosophy; the nutrition of the dentine is in the intertubular part or connective tissue; the nutrition of these intertubular substances or fibrils is vegetative, or by a to-and-fro current of circulation. That circulation, as long as it is supplied with lime, is continually adding matter to the tubules, so as at last to solidify the entire territory and remand it back to the mineral kingdom. Coming to the cement cells, we are still rising in the amplitude of the currents of nutrition, and in complication of the modes of motion.

When we get successive deposit, solution, and removal where a deposit was made, the first deposit is most calcified, and the last the least so, or with more of the canaliculi within them. The question was, what was the mode of nutrition? Was there any vitality in them, and could you reproduce it? It is doubtful whether you could reproduce any cement. You may have a dissolution and a re-deposit, but it would come by a calcification of a new cell belonging to the series that is beneath, and when all the germs of these cells shall have been exhausted, that is the limit of your calcification, and if you have a development after that, it is simply creation and not reproduction.

PROFESSOR MCQUILLEN: In listening to the reports which were made this morning, I was very much gratified to find that one of the gentlemen referred to in the report, Dr. Chase, had been engaged in the preparation of microscopical specimens, and in making microscopical observations. I was gratified to learn that fact, for I regret to say that, so far as our reports in this Association are concerned, there has been too much of a disposition on the part of gentlemen to avail themselves of the investigations of eminent histologists abroad, and I have been delighted on various occasions to observe how well informed many of the members of our Association have been on advanced histology, so far as the observations of Owen, Tomes, and others in England and Germany are concerned. We all recognize, however, that Americans have eyes and ears, and it seems to me that they could use them to just as much advantage as European microscopists. The microscope in this country as a rule, is too much of a toy. Gentlemen use it only for amusement. Therefore I am glad to learn of this movement.

In looking over the photographs offered in illustration, I find them to be as fair specimens as I have seen, but at the same time such photographs will never take the place of the microscope and the object under it. The reports should be (and during my connection with the committee I have endeavored to make them so), as far as possible the results of original investigations, backed up by the object under the microscope.

In one of the reports offered, I do not remember which, reference was made to the views of Tomes and Nasmyth in relation to the appearance presented under the microscope by dentine in relation to

its formation, and we were carried back to the discussions that occured in former years in relation to the question as to whether dentine consisted of baccated fibers or whether it was a combination of cells, by means of which we had what is known as the tubular and intertubular structure. Passing from the consideration of that, we come to the consideration of the foundation of dentine itself.

Dr. Atkinson very properly took exception to the view of a pulp being a cell, in place of it being, as it is, a combination of cells. He went on to describe the manner in which enamel is formed, and the manner in which dentine is formed. But here, to properly understand this question, it seems to me we must go deeper than that. We must go to the origin or beginning of the structure of life. Exceptions may be taken to this by those who do not recognize the distinction between animate and inanimate nature, but this is a view sustained by the best authorities.

The original formation of tissue, and the maintainance of that tissue in the process of what is known as nutrition, is not a subject for microscopical observation. We can observe such formations, but we cannot perceive the act of formation, or the process of nutrition. It is too subtle. We may theorize upon it, but that is all. In physiology I was taught as a student, and as a teacher I have taught, that *omne vivim ex ovo*, from a living system all things rise. I received and honestly taught it, and believed it for years; but, gentlemen, I am now a skeptic in relation to it. In the institution with which I am connected I cannot teach this old principle as true. I am not prepared to say it is false, but I cannot regard it as beyond question a true one. We are informed by clear, philosophical observers, such as Bastian, that a formless, pure fluid, which has been subjected to an intense heat, and which has been so kept that no organic life could possibly get into it, that from such fluid life has been evolved *de novo*. In relation to the theory that it requires an existing germ out of which a substance is to be formed, there are those who insist even on the necessity of a germ-crystal in a fluid out of which crystals shall be formed. Most people laugh at such an idea, and yet such views as that have been advanced and supported by able arguments. But if it be true that it does not require a germ out of which a crystal shall be formed, it seems to me

reasonable to infer that out of a fluid containing apparently no organic elements, we may have life evolved *de novo*. In a living organism the possibility of the organization of anything like a substance *de novo* seems impossible. So far as the fluids circulating in vegetable and animal organisms are concerned, we find living fluid in contact with living substances. Under such circumstances it is the living dependent upon the living; but the existence of the vegetable is dependent upon its obtaining from inanimate matter by solution and by absorption, the inorganic substances out of which it is to be formed. And the same is to a certain extent true of the animal. It does not subsist upon living matter. We, as human beings, to a marked extent, animals not to the same extent, live upon what we denominate dead matter. We destroy the animal, we destroy the vegetable. We not only destroy it so far as its somatic life is concerned, but by cooking we destroy the molecular life. It is taken into our organism as dead matter. It is masticated, insalivated, undergoes the process of digestion, and eventually becomes part of our organism. Now when does it pass from the dead into the living substance? When does that carried into our organism as dead matter become vitalized? Is it when the assimilation takes place, or after that? Do not we here have a case of the evolution or development of life *de novo*? Be that as it may, these are subjects, it seems to me, which ought to be brought into connection with this matter of the development of tissues, and the process of nutrition.

In the reports read, and in the discussions we have had, it seems to me there has not been a full recognition of the present views entertained in relation to the formation of dentine. In former times, in speaking of dentine, Owen, I think it was, regarded the formation of dentine as a centripetal process of calcification of the pulp. We recognize at the present time that there is in that pulp a congeries of cells, arranged without apparent order. In process of time these cells become arranged in a lineal form. In addition to this it is now held that the cell itself undergoes a peculiar change, becoming an odontoblast, and these are arranged side by side, forming on the outer portion of the pulp a membrane known as the *membrana eboris*. And this is elongated side by side, having, in

addition to its peculiar elongation, prolongations projecting outward into the cell itself; not merely one, but possibly two or three. As these are side by side, calcification takes place between these odontoblasts, and this constitutes what has been denominated the intertubular structure, or the matrix which holds the tubules together. Inside of that again we have the inner portion of this cell, which has undergone a gelatinous calcification, forming the cell wall; the wall of the dentinal tubule, or sheath of Neuman, and inside of that a prolongation directed forward (ostoblasts) which retains its soft-solid character, and which is not converted into dentine by any deposition of the calcareous matter as the other portions have been. This constitutes what has been denominated by Tomes as the dentinal tubuli.

I offer this for what it is worth. I only regret, so far as I am concerned, that I have not here to offer, as I claim that a man should have, the results of original investigations. I trust the time will come when our dental institutions will be so situated that young men possessing the taste and ability shall have an opportunity of devoting themselves exclusively to original investigation. When that time comes then America may make its contributions to dental science as England and Germany are able to do at the present time.

Dr. Atkinson: I am sorry there are so few willing to take part in this discussion, but we should be thankful that we are able to begin to make the marks constituting the alphabet of our learning in this direction.

The last speaker gave us a theory of the beginning of life *de novo*. He must classify better than he does before we shall know what he means. It is true we shall never know anything about the origin of life until we shall have gone to the bottom; but does his theory have this final and ultimate basis?

Let us nominate a few things which may help us to an apprehension of what we mean by life. There is a substratum which is nominated atom. That is the lowest manifestation of material existence of which we know. And we know of no function that is not in immediate connection with some combination of atoms. Atoms themselves are already endowed with life. Atoms cannot

be killed. There is no such thing as atomic death. Then where is that inception of life which is spoken of? We have been told that our food is in a state of molecular death. What a conception! Molecular death, and yet capable of containing the elements of life! Let us see what it means. The affinities resident in the atoms, upon being brought within the sphere of influence, coalesce according to the bonds of affinity governing them, and form molecules. Those molecules are the plasma out of which all formations take their origin, and by which they are maintained during the period of their possible existence as aggregations of molecules. Something must die that something else may live. The mistake is that we do not recognize the differentiation of the manifestations we call life. I gave you a synopsis of that this morning.

We had crystallic life, but there is an aggregation of something below that again. I did not define what a crystal is. It is formed of regularly arranged granules, that are regularly arranged molecules, that are regularly arranged atoms. And if in the vegetable kingdom you have, in addition, cellular life, you have also a correlation of cells constituting tissual life, and an aggregation of tissue forming organs. Then we have systemic life, and the complete system holds the somatic life which dominates the entire organism. And in that somatic life in the animal dwells the conscious life, by which we apprehend these manifestations. When you have destroyed conscious life you have not destroyed atomic life, for when that has left the organism we have remaining all the affinities I have spoken of as somatic life. Food is life in a protoplasmic mass; molecules with the presence of all but that special kind of life. That is food. That is the chaos out of which we live.

"*Omne vivum ex ovo*:" "All living things come out of an egg." It depends upon what you consider an egg, as to the truth of that. If you say a protoplasmic mass is an egg, it is true, because you get nothing without the substratum of general principles which it becomes the differential expression of. But what does Bastian's investigation prove? It only proves that these points of origination of apparent manifestations of life are points so small as not to have been detected before, and in fluids which have been subjected to degrees of temperature which were before considered fatal to all

forms of germs. That is all it proves. It does not prove that these are not essentially eggs.

Dr. McQuillen said there were very few people such fools as to say there was a germinal point around which the particles of a crystal aggregated to form a crystal. I told you this morning what it was; merely a polarization and de-polarization of currents producing a crystal. It is nothing in the world but pure water. You know water being frozen is larger than it is in a fluid state, and there has been much discussion as to whether it is actually larger; whether there were not interstices between the crystals filled with air. That, however, is proved to be a fallacy. We do not know much about size anyway, and it is difficult to prove anything when we come to atoms. We can only surmise that an atom is about the two hundred millionth of an inch in size. Now, suppose a current of thermal action is passing two ways, that is to say, one side of a body of water is warm and the other side is cold. You see there will be a current going up and down. If it is in the case of water that is deep, that polarization and depolarization of the current brings you to a point where the currents are *nil*. At that point freezing begins, and the freezing is simply the arrangement of its molecules in crystals. It does not make cells in that case at all, and the first arrangement is the laying down of granules. It is only an aggregation of molecules of water—molecules of water being two equivalents of hydrogen and one of oxygen; in other words, one dyad of oxygen to two monads of hydrogen. Let the oxygen be represented as an individual with two poles, each one seizing an atom of hydrogen. When it does so seize it, the size is reduced, I don't know exactly how much, but very many times. As long as that form holds together we have water, but when the currents change the water from a fluid to a crystalline form, we have an example of polarization and depolarization.

REPORT OF THE COMMITTEE

ON

DENTAL CHEMISTRY.

By H. A. SMITH, Chairman.

In presenting a report on Dental Chemistry, I would first direct your attention to a subject which has been investigated with considerable care, during the past year, by Dr. S. B. Palmer, a member of this committee, viz: "Chemical and galvanic action upon teeth, and the materials used for their preservation." Dr. Palmer assumes that the failure of the operation in so many cases in which the teeth have been carefully filled with gold, amalgam, etc., is due to an electro-chemical decomposition of the tooth-substance, induced by the electric current set up between the tooth-bone and the material used for filling. He adopts the hypothesis that caries of the teeth is a result of chemical action, and is governed by certain laws of nature, known or unknown, and that the materials commonly used for fillings are simply agents designed to prevent this chemical action; that the cavity of decay is a cell, in which chemical decomposition goes on more or less rapidly until the surrounding walls are broken down. The cavity once filled, and the fluids, or

agents of circulation, being shut out, chemical action is arrested, and the tooth, we say, is preserved. The operation of filling teeth is generally regarded as a mechanical one, the law or principle upon which it is based being the exclusion of moisture. It is also considered that gold is the best material to use for the purpose, and that failure is the result of the inability of the operator to make a moisture-tight filling. Another and more natural theory is, that since caries is a result of chemical action, this action may be arrested in some specific cases, more effectually by the use of other material than gold, and in which gold would undoubtedly prove a failure. It is necessary to chemical action that two or more elements be brought to influence each other. There must also be a fluid or semi-fluid medium, in which the molecules are free to obey the laws of chemical affinities. All matter contains a greater or less amount of electricity in a latent condition, which, in the dry state, remains unchanged, as, for example, a tooth in the cabinet would remain for ages; but bring the tooth into contact with another element or compound containing more or less electricity of the opposite character, in a fluid that will allow circulation, and there will be an effort made to restore the equilibrium between the two bodies; one of which may lose both texture and form in its affinity for the other elements brought in contact with it, and that, too, by the agency of circulation induced by the presence of an element unaffected thereby. This appears to be a law governing all matter. The metals have been divided, according to their electrical conditions, into positive or negative when excited by a given solution in a Voltaic battery. Thus, in a battery constructed of copper and zinc plates, immersed in acid, the copper assumes the negative, the zinc the positive. Exchange the zinc element for one of gold, and the copper at once becomes the positive, and like the zinc, though in a less degree, will be consumed; that is, in consequence of removing the zinc plate, and substituting one of higher order than the copper, the latter becomes electrically changed, or of different polarity. The same is true of the current passing from the copper, as may be seen in testing with a compass needle. A change of solution from acid to alkaline frequently changes the polarity of the elements without removal or substitution of one plate for another. Dr. Palmer's ob-

servations have led him to believe that dentine, oxy-chloride of zinc, and amalgams are subject to the same law. When tested by the galvanometer, with saliva for the fluid, the following is the electrical standing of the elements used for preserving teeth, dentine being also included in the list: Gold, mercury, oxy-chloride of zinc, dentine, tin, amalgam and zinc; the latter is added simply to indicate the zero of the scale. By testing the same materials in weak acid, the order is reversed in some of the elements, as may be seen by comparison with the above: Gold, mercury, amalgam oxy-chloride, tin, dentine. Thus it will be seen that gold and dentine are the extremes of the list when excited by acid solutions, the latter becoming the positive element, or element acted upon. The law is that, between the extremes (of any correctly arranged list of materials) will be found the greatest chemical action. Between any two nearest together the action will be slight, as between platinum and gold, or tin and amalgam; so slight, indeed, that a change of temperature of the same fluid, as well as change of fluid, will often change polarity and reverse the action. Again, the current which passes from the negative element is termed positive, or bears the name of the opposite element. To be better understood we term the positive current the acid current, such being its action upon the element consumed as well as its action for acid tests, while the current which passes from the positive element, like the zinc in a battery, possesses alkaline properties, and so reveals its action. The latter current, in the ordinary galvanic cell, is confined to the fluid, passing only from plate to plate, while the acid current, so to speak, passes from pole to pole, outside of the cell.

It may be argued against this theory, that gold, being a non-oxydable substance, can excite no action upon a tooth. But, as Dr. Palmer states, gold becomes an agent of chemical circulation, and, in consequence of its negative properities, does supply a decomposing current, which keeps the surface beneath a leaky filling in an irritable condition; while with any of the lower grades of materials, which stand nearly upon the plane of equilibrium with the dentine, less action is produced and less breaking down of the tooth structure results.

Tin, being the nearest to dentine, not only arrests decay, like gold, *mechanically*, in ordinary teeth, but in frail, chalky structures acts

as an ant-acid element, neutralizing fluids that otherwise would become acids. Thus we have antiseptic effects from tin in a specific class of teeth. Gold, in a well organized tooth, is the best filling, as dentine and enamel, in a normal condition, are non-conductors of the galvanic current, not liable to chemical action; consequently no harm arises from union of either with gold.

Oxy-chloride of zinc fillings, when submitted to the electrical test, stand nearly neutral to the teeth. Such fillings cannot promote chemical action injurious to the teeth, but the filling is not itself free from chemical action, and thus it cannot be relied upon as a permanent plug.

Amalgam, when compared with dentine, tin, oxy-chloride, etc., (contrary to previous opinions,) stands above in the scale, and is, therefore, in a degree, liable, like gold, to excite chemical action unfavorable to the tooth. This cannot be otherwise, as amalgams are composed of mercury, silver and tin, with the addition of other metals still finer. Tin being the lowest in the scale of oxydation, the compound is raised, as indicated by the test, quite above dentine or tin alone, which is a step in the wrong direction, for the antiseptic property is much needed in teeth where amalgam would be called for.

According to the theory advanced, if the compound of metals previous to amalgamation is finer than the mercury to be added, nothing short of a perfect combination can prevent the mercury from being acted upon by the current induced by the finer element. The effect of such action is visible in the fine pits and ragged edges upon the surface and margins of the plug, which, previous to chemical action, were filled with uncombined mercury. On the other hand, if the compound, previous to amalgamation, be nearly equal to or below the mercury, little or no oxydation will take place. The plug will present a smooth and even surface; the mercury will not be acted upon; the plug will give little or no evidences of shrinkage, and the compound, as a whole, will stand in favorable relations to the dentine.

Dr. Palmer believes that a proper understanding and application of the laws of chemico-polarity in the selection of materials for filling teeth would lead to a more judicious choice by the operator,

and in many cases in which gold is now used, other materials would be substituted and conscientiously recommended.

The amalgam question, if we may judge by the extent of the literature which has appeared upon the subject during the past year, is again prominently before the profession. Of the number of papers published, the two contributed by Drs. Hitchcock and Bogue to the Odontological Society of New York are especially worthy of consideration.

Dr. Hitchcock's paper relates more especially to the physical properties of amalgams. While this study is of the greatest importance in fixing the true value of amalgams for dental purposes, the study of the chemistry of amalgams must take precedence. Though we should have the *ne plus ultra* in amalgams, so far as relates to expansion, shrinkage or discoloration, still the unsettled question remains: Do these compounds effect injuriously the human system? These differences of opinion, honestly entertained by the profession, can only be settled by extended and carefully recorded observations, aided by the science of chemistry. If chemical investigations show that compounds of mercury are formed in the mouth in sufficient quantities to affect injurously the health of our patients, this would at once settle the question of the impropriety of the use of amalgams in dental practice.

Dr. Bogue, in his paper, gives the full details of a series of experiments particularly directed, he says, toward this mooted question. With this purpose in view, twelve specimens of amalgam were experimented upon, by carefully filling a tooth with each of the specimens, and then placing the filled tooth, together with a pellet of the same amalgam—first carefully noting the weight of each—in a bottle containing saliva acidulated with each of the following acids: nitric, hydro-chloric, citric and acetic, to a degree sufficient to act readily upon the enamel of the teeth. These bottles, forty-eight in number, were placed in a water bath and kept at or near 100 degrees of heat for three months. The teeth and pellets were removed singly, washed, and once more carefully examined and weighed.

Dr. Bogue, after a minute record of both the chemical and mechanical tests, with each of these specimens, concludes as follows:

"These tests were needed to enable us, as a profession, to say positively whether or not the mercury in an amalgam filling, or any number of amalgam fillings, properly inserted, could, by any possibility, cause mercurial symptoms, or mercurial poisoning with unrecognized symptoms. And, as has been shown, three months and over of chemical action so severe as to almost completely disintegrate or dissolve the enamel of most of the teeth subjected to the test, has failed to diminish the aggregate weight of the amalgam pellets that were subjected to the same tests as the teeth with their fillings, more than about three grains in nearly 11½ pennyweights. That is to say, the gain from the addition of oxygen by the oxydation of the surface of certain pellets has nearly balanced the loss of weight of certain other pellets, so that the pellets now weigh, in the aggregate, only about three grains less than at the beginning of the experiments, the copper being the greater loser; and copper amalgam is not used in this country, though it is in Germany."

To verify this statement, the fluids in which these teeth and amalgam were lying in corruption together, were carefully tested for mercury by Dr. Bogue, and also by Prof. Chandler, of Columbia College School of Mines, and none found in solution. After a few observations upon the physical properties of these amalgams, Dr. Bogue finally says: "It will be seen that, if almost any amalgam is used intelligently, teeth can be filled, not only so as to preserve them, but to do so without danger to the general health from any element of the filling, unless it be copper. Of this I am not sure."

A favorite method of conducting inquiries as to the physiological effects of amalgam fillings has been to form a hypothesis, and then calculate what would happen if the hypothesis were true. For example, it has been ascertained that certain free acids are found in the mouth, which are constituents of the salivary fluids. With the acid saliva, and the presence of amalgam fillings in the mouth, we have a chemico-polar arrangement, which results in the formation of the oxides and sulphides of mercury. The former, in the presence of hydro-chloric acid, is decomposed, and the sub-chloride of mercury, or calomel, is formed. Hence, we may have the usual constitutional effects of this active compound of mercury. These are the results, and if the actual phenomena agree with them, we

say the hypothesis is verified, but only so long as no other hypothesis is invented which agrees still better with the phenomena observed.

The experiments of both Dr. Bogue and Dr. Palmer, to which I have directed your attention, and the conclusions to which they have led, would indicate that there are irreconcilable differences of opinion among the members of our Association as to the physiological effects of amalgam fillings. But when members can free themselves from prejudice, and base their opinions upon the results of actual demonstrations, as these gentlemen seem to have done, it is evidence that progress is being made, and that ere long, through the aid of chemical research, the question, whether or not amalgam should be used, under any circumstances, as a filling for carious teeth, finally settled.

Dr. J. S. Cassidy, a member of the committee, contributes the following upon the subject of bleaching teeth:

A tooth, having lost all or the greater portion of its vitality, either through external encroachment of caries, or internal physical death, will, in nearly every instance, assume a more or less darker color than it possessed when endowed with active life; the increase of color being due to changes in the innate character of its own substance, or to the action of external bodies capable of introducing into, or forming with the constituents of the tooth, insoluble compounds which do not reflect all of the solar rays.

The decomposition of the earthy portion—viz: the calcium and magnesium phosphates, calcium carbonate and calcium fluoride—does not directly exert any appreciable influence in changing the color to a darker hue, inasmuch as disintegration of the part is accompanied by solution and consequent disappearance of the calcium compounds, or by the production, (in rare instances), of a calcium precipitate, which, if chemically pure, is destitute of color. Comparatively few organic acids, when acting on calcium compounds such as are found in tooth bone, are able to effect precipitates in saliva. This is also true with respect to the majority of the mineral acids, notably excepting those of sulpher. Sulphuric acid, reacting on calcium carbonate, gives insoluble calcium sulphate,

($Ca\,SO_4$), and in this latter case the intimate mixture of the insoluble body with the nonputrefactive carbonized gelatin of the tooth, affords a protecting surface against further encroachment upon the bone beneath. It follows, therefore, that we are not to attribute the increase of color throughout the body of a pulpless tooth to chemical changes in the normal relations of its calcium compounds. Neither should it be considered as resulting solely from the presence of gelatinous residuum, as this tissue is naturally colorless, and if affected directly—*post mortem*—by chemical action, and its identity destroyed, a large portion disappears by its constituent elements escaping as gases. The degraded residue, however that may remain *in situ*, in connection with partially emptied interdentinal tubuli offers a most convenient receptacle for colored matter of whatever kind.

Nearly all of the gases and fluids whose development is concomitant with the so-called putrefaction of organic substances, are produced with peculiar facility in the oral cavity, and although some of them, as found in the mouth, are true, sharply defined chemical compounds, the greater number are held together in apparent heterogeneous association, in which the most delicate tests and processes in analysis are practically futile. Their general complexity of constitution, and favorable situation, admit of their indulging in almost endless reactions, the factors being scarcely less definite in their nature than many of the bodies thus formed.

Among the few well known gases that have been isolated in response to appropriate tests is hydrogen sulphide, the favorite reagent in every chemical laboratory. Through its influence a large per cent. of soluble metallic salts part readily with their metals in the form of precipitated sulphides, according to the insolubility of the latter in either acid or alkaline solutions. These precipitates—presented as but one example of the manner in which coloring matter may be formed in the mouth—possess varying degrees of color, and when formed in, or received into, a semi-diaphanous and porous substance like a deadened tooth, necessarily lend to that substance the peculiar shading characteristic of each.

To the question, "Can such teeth be permanently restored to their original color?" an affirmative answer, the writer thinks, at least as re-

gards the greater number, may be safely made; but as there is a positive tendency to the formation of undue quantities of dangerous acids by reaction of the agents ordinarily employed for bleaching, the process may result in an injury rather than a benefit, unless the utmost care, commensurate with the value of the organ, be observed.

It would be incompatible with the limited number of experiments made thus far in this connection to offer suggestions as to remedies that can successfully meet the requirements of each case, but if restricted to a single, though rational line of treatment, we would say that a simple method by which nascent oxygen is developed in sufficient quantity, is the best; and ignoring, for the present at least, a few minor experiments recently made with this object in view, the writer begs leave to submit a simple, though not altogether an original plan of treatment pursued successfully in a number of cases in actual practice and otherwise.

One of the most remarkable recognized properties of the element chlorine is its bleaching power, a property, however, which is manifested only through its ability to develop free oxygen from water. Dry chlorine does not bleach; there must be moisture present in order that it may exert its affinity for hydrogen, and thus set oxygen free, which latter element, in its *nascent* state, attacks the coloring matter, and forms with it compounds that are destitute of color. The writer's experience in bleaching teeth has led him to believe that pure, unadulterated chlorine is the best agent to employ for this purpose. A safe way to obtain pure chlorine in any desired quantity for convenient and cleanly application to a darkened tooth is by reaction of hydrochloric acid on black oxide of manganese. Take a small retort, or flask, to which is attached, by means of a perforated cork, a properly bent glass (or rubber) delivery tube two or three feet in length, and one-half inch in calibre; then pass the other end of the tube through the open mouth, and to the bottom of the receiver. Place in the retort three parts strong hydrochloric acid and one part of finely pulverized black oxide of manganese, and agitate the mixture; next insert the cork containing the delivery tube and apply a gentle heat. The manganese parts with its oxygen, which latter element appropriates all the hydrogen of the acid; one-half the chlorine of the acid unites with the manganese to form manganous chloride, and the portion of

chlorine set free passes through the delivery tube to the receiver. ($Mn\ O_2 + Hcl = Mn\ cl_2 + 2\ H_2O + 2\ cl.$)

On account of the high specific gravity of chlorine, it may be collected by simple displacement of air. An ordinary small bottle will serve admirably for a receiver, and when full—a fact easily ascertained from the yellowish-green color of the gas—the bottle should be closed with a cork. A most convenient apparatus for immediate conveyance of the gas to a tooth is made by merely inserting through the cork of the receiving bottle a straight glass tube six or eight inches long, the upper extremity being drawn to a point, and having a small aperture, which is stopped with wax except when in use. The tooth should be isolated by means of rubber dam, and this material should also be placed over the mouth and nostrils of the patient, in order to prevent possible inhalation of the irritant gas. By inverting the receiver—having its cork and containing glass tube in position—and applying the tapered point of the tube to the cavity, the surface of which is allowed to remain somewhat moist, the gas, being considerably heavier than air, will pass downward through the tube into the interior of the tooth, an observable whitening of its substance being, in a majority of cases, the immediate result.

Dry chlorine, as before remarked, does not bleach. Either the colored substance must be in a state of solution, whereby colorless chlorides can be produced, or moisture must be present to induce the development of nascent oxygen; and in regard to the reaction that occurs when chlorine is applied to a tooth, as herein described, the characteristic affinity of the element under the circumstances, and better still, subsequent tests, prove the formation of hydrochloric acid, a fact which suggests nascent oxygen as the active principle which successfully changes the coloring matter into colorless compounds. An equivalent of water undergoes decomposition by abstraction of its hydrogen to satisfy the chlorine, a process which occasions coincident evolution of free oxygen. ($4Cl + {}_2H_2O = {}_4\ H\ Cl + 2\ O.$)

It is well to remember that hydro-chloric acid (Hcl) is destructive to tooth substance, especially to the calcic portion, and, therefore, the immediate use of an alkali, such as lime water, is recommended to neutralize its baneful power; otherwise disintegration of the

part will proceed in proportion to the amount of acid produced. It may also not be out of place to remark in this connection that the writer's experience in generating free chlorine by the action of acids on bleaching powder—a process frequently adopted for this purpose—does not agree with preconceived favoring opinions on the subject. The disappointment being, perhaps, not merely due to possible deterioration of the powder, which at best contains only a small per cent. of available chlorine susceptible of being liberated by an acid, but, in all probability, rather to the liberation of hydrochloric acid in excess before reaching the final point of oxydation. Bleaching powder appears to be constituted of calcium hypochlorite and calcium chloride, and if acted on by an acid (oxalic for example) it yields its chlorine only after intermediate acid-forming stages, according to the following equation:

Bleaching powder,	Oxalate acid,	Calcium oxalate,	Hypochlorous acid,	Hydrochloric acid.

$$Ca\,cl_2 + Ca\,Cl_2\,O_2 + 2\,C\,H_2\,O_4 = 2\,C\,Ca\,O_4 + 2\,H\,cl\,O + 2\,H\,cl.$$

The free hypochlorous and hydrochloric acids react on each other, yielding water and free chlorine, ($H\,cl\,O + H\,cl = H_2\,O + Cl_2$) which latter bodies are converted into hydrochloric acid and nascent oxygen, ($H_2\,O + 2\,Cl = 2\,H\,cl + O$.)

DISCUSSIONS.

Dr. Palmer: As I have been freely quoted upon this subject, and as it is a branch of study which has not before been presented, perhaps I ought to condense and explain rather briefly the matter already laid before you.

I wish to say, with reference to the application of this theory, that there are two distinct classes of teeth which come under our care. The first are those which are well organized, or in a normal condition, except that they have become decayed and demand our

attention. For such I use and recommend the same as others, viz: gold; because there is nothing objectionable in the material, and it is a purely mechanical operation, plugging the cavity, excluding the moisture, and checking the chemical action.

There is another class of teeth, of a chalky and undeveloped character, which require our attention, and which are to be treated differently. We find examples of this class in the six-year molars of children. In such cavities the experiments I have been making for some years demonstrate that gold is not the best preservative agent. Tin better serves the purpose in such cases, and the reason of it is clearly answered to my mind by known principles of chemical and galvanic action. Take the action we have witnessed in the galvanic cell. We place in the galvanic cell any two elements, usually one higher and one lower, as copper and zinc, carbon and zinc, or platinum and zinc, because the further you get the two elements apart, the higher the one and the baser the other, the greater is the chemical action. Now any substances that are influenced at all by chemical action, are elements subject to galvanic action, and the one assumes, when brought into contact with the other, the positive pole, and the other the negative relation. Those relations are changed by the temperature of the fluid, and by various fluids, whether alkaline or acid, but, nevertheless, they hold those relations instantly when brought into contact with each other. The idea has been advanced that only metals or certain minerals were elements to form this galvanic action, but on experimenting and measuring the current we find that dentine as well is an element, to be arranged by the side of gold or tin, and we also find that the different materials used for filling hold the same relation as the copper and zinc in the battery. Now, the destruction of any one of those elements is in proportion to the galvanic current produced, or the chemical action going on in the cell. Well organized dentine is a non-conductor; insert the gold and make a moisture-tight plug, and the tooth is preserved for an indefinite time. But in a porous, poorly organized tooth there will be circulation, or moisture allowing circulation through the pores of the dentine. You have placed there an agent of chemical action. The gold is not influenced, but becomes like a platinum plate in a battery. Amalgamated zinc will

stand for years, until you make a connection of the poles, and then the zinc, being the positive element in producing the current, is destroyed. Just in that relation stands the dentine when filled with gold. If porous, then the action is thrown upon the dentine. You will find in such teeth that in one, two or three years the filling becomes loosened, or the bone softened under the filling, and we can measure it by the galvanometer and see the deflections produced.

Some, as, for instance Mr. Fletcher, claim that the greater antiseptic properties of tin, as compared with gold, are due to the plasticity of tin; its adaptation to the walls of the cavity. It is something more. In comparing the relation of the tin and dentine they stand in almost the same electrical condition. It is the law that when two bodies stand thus, there is little or no chemical action. Now, when tin is placed in the condition in which we find it in the mouth, the tooth substance assumes the negative relation, while the tin is rendered the positive element, to be consumed. There may be a slight oxydation of the tin, but no corrosion or oxydation of the tooth. The action is so slight that it would be almost imperceptible, because the loss is going on in the plug itself, and that only upon the surface. But put the same elements in an acid solution, and the order is slightly reversed. In an acid condition the action would go on in the dentine, and the tin would not be affected. On the other hand, if we substitute gold for the tin in an acid condition, we shall have the most decided action.

Now, in relation to amalgam, my experiments by the same test have somewhat changed my views in regard to it. There is nothing I have tested which is so close to the electrical condition of dentine as tin. Amalgam stands nearer to gold. The more porous kinds, however, are much like tin. Now, the idea of improving the antiseptic qualities of amalgams by making them finer, is absurd. Supposing we had gold and mercury; we have raised the standard so far above dentine that it would be, perhaps, fifty per cent. more than tin. If there were no injurous effect from zinc, it might be reduced to about the same electrical condition as dentine.

In mercury with silver we find some of the same objections as obtain against gold; it is higher, electrically, than dentine. Again, when we take any two compounds and bring them together in con-

ditions in which the current can be established, that current, passing out from the finer to the coarser, is an acid current. Take the battery, for instance, having a platinum plate and a zinc plate. The current passing from the platinum around to the zinc, when tested with litmus paper, gives an acid stain. The current passing from the zinc through the fluid to the platinum, gives an alkaline stain. Placing a tin plug in the tooth, we have simply placed there an alkaline element. Thus we have the tooth in its neutral or normal condition, being exposed to little chemical action. This is the law which we have been searching for. The current, in passing from the finer element, the platinum, to the zinc in the outside of the jar, is acid, which may be irritable to the dentine. That passing from the zinc through the fluid to the platinum would correspond to the alkaline.

I do not wish to be understood that it is the galvanic action going on which destroys the teeth. I am not prepared to say whether the chemical action furnishes the galvanic current, or the current induces galvanic action, and I am not able to say which is the destroying agent.

In relation to the teeth we must act intelligently. We cannot build up a tooth contrary to the laws of chemistry. The tooth is of such a structure that under such circumstances it is impossible to make a durable plug.

A MEMBER: I would like to ask Dr. Palmer what he considers the best materials for amalgams.

DR. PALMER: I present any views upon this subject with a great deal of hesitation, and in attempting an explanation in that direction I hope it will not be considered that I would recommend amalgam generally for plugging teeth. The cases are few which demand amalgam, but when that is used, it is desirable to use it according to chemical law, and use the best material.

I will say here that tin, if it would stand the abrasion, would be preferable to amalgam, because the elements composing amalgam are above those of tin as compared with dentine. Any attempts to improve an amalgam by the use of gold, platinum, etc., is in the wrong direction. In amalgams made of coin we have the metal and the mercury, two elements to be blended; and this composition

is often chemically composed so that it represents but one metal. In the old coin amalgams we had a material that preserved some teeth very well, but there was always an oxydation, more particularly from the copper. It penetrated or was received into the dentine. It might be years before this discoloration would reach the pulp, but when it did so its effects were poisonous, and liable to destroy the vitality of the dentine and pulp.

In preparing the composition we must be careful not to get a metal so base that the oxyd of it will be destructive. Tin seems to be least objectionable. On the other hand, supposing we get an ingot of superior fineness; supposing it is composed of gold and platinum. In order to preserve the physical relation of the amalgam, or make it hard enough to stand attrition, it has been prepared fine. When we compound it with mercury, unless there is a perfect union, we will see the same effect that we used to see from the fillings of silver coin; we will see the mercury dissolved, leaving edges of the plug ragged, and the whole plug porous. And why? Because the composition of the amalgam was of such fineness that it became the negative element, and rendered the mercury positive. The amalgam should be of such composition that the metal and the mercury shall be in about the same electrical state of equilibrium. Then there will be no dissolving of the one or the other. We must get the amalgam in that condition in which there shall be no chemical action in the elements of which it is composed, and at the same time have the mass correspond in electrical condition with the dentine. In some of the amalgams of the present day we see that almost attained; so nearly so that there is very little discoloration, and no roughening of the surface of the plug. As I said, in any effort to make the amalgam too fine, you will preserve those fine metals at the loss of mercury. If the mass of metal is below that of the mercury, the latter will not leave it.

The President: The idea has been suggested, whether an application of creosote to the dentine, to make it dry and compact, would not induce this condition, so that gold might be used in those cases in which you say tin is best.

Dr. Palmer: There is one figure that will express my idea as to the difference between gold, tin and dentine, better than any thing else, and that, perhaps, will answer your question.

We will suppose that an iron tooth was worn in the mouth, and that a place in that tooth needed filling. What sane person would have that tooth filled with gold, knowing anything of chemistry or galvanism? Would he not rather put in a zinc plug? With the former you reduce your iron tooth to the positive condition, while the gold is decidedly negative; the corrosion is entirely upon the iron, and it is affected more than if the gold plug were not in it.

The theory I have introduced brings dentine into the same position as the iron. It is rendered positive or negative to the plug coming in contact with it.

Some two years ago I inserted a partial gold plate for a gentleman, who returned very soon saying that it caused a flow of saliva to collect in such a manner that he could not wear it. I understood at once the trouble, but the remedy did not suggest itself immediately, but it occured to me to boil it in strong soda. I did so; he went on wearing it, the system became changed, and he wears it now without difficulty. This boiling merely changed the surface of the plate somewhat. That was negative, the system was positive, and the cause of this salivation was a changing of the alkaline secretions of the mouth into acid. I do not wish to be understood as saying that the galvanic current destroys the teeth, or eats away the dentine. It is simply an evidence of chemical action, and where that is going on there must be destruction of some of the elements.

Dr. Taft: In a great many instances where gold and amalgam fillings are in the mouth, it is found that the dentine immediately about the borders of the gold filling has become softened and decayed, while about the amalgam filling no such decomposition takes place.

Dr. Palmer: As I have already said, the gold, or the negative element, sends out from itself an acid current, while the lower metal, which may be amalgam, or tin, produces an alkaline current, which harmonizes, in its electrical condition, with the dentine, and you will find it in a state of neutrality. Adjoining the gold producing the acid current you will find a dissolving of the lime salts in consequence of the wasting of the fluid.

Dr. Taft: Do I understand you to say that this electrical cur-

rent produces the acid current, so as to act chemically upon the lime salts?

Dr. Palmer: Yes, sir; that is the idea.

Dr. Taft: Is it not by decomposition of the fluid in that immediate vicinity; by decomposing and recomposing an acid at that point?

Dr. Palmer: I have in my laboratory a LeClanche battery, and in that stand two elements, one an amalgamated zinc rod, not over two or three ounces in weight, standing in a solution of muriate of ammonia, in a porous cell. That stands there just as your filling stands in a tooth. They will remain two or three years, no action going on; but simply connect the poles and you have got a strong current that will dissolve both elements in this case. I cannot tell you whether the chemical action produces the current, or the current the chemical action.

Dr. Taft: Does decomposition naturally precede the electrical movement or current?

Dr. Palmer: That would probably be the case in the instance you cited, in order to establish a current, but if you get a current you get decomposition instantly, and in two elements where we do not know which way they stand, if you immerse them in a solution they instantly assume the positve and negative relations. Now, take the same two in another solution and you may reverse them, or even in the same solution at a different temperature. It is in consequence of the action of a circuit, and in the case cited it is increased by the presence of the two fillings.

Dr. Taft: It has been stated by some that the vapor of mercury will not pass into dentine. Why is it that dentine is frequently found discolored, even into the root sometimes?

Dr. Palmer: I regard that as an oxydation of the plug. It may be mercury, but more probably copper. When we used fillings containing copper we saw more of this. By capillary action it is drawn into the dentinal tubuli, in consequence of the tooth being in a porous condition.

Dr. Osmond: In regard to the action of amalgam and gold fillings when placed in the mouth, I have noticed that the dissolving of the dentine around the fillings takes place generally where there

is an acid condition of the mouth. Chloride of sodium is found in large quantities in the human body, especially in the saliva, and we have, in such cases, decomposition of that binary compound, and the elimination of acids around the gold filling, or negative pole. The acids have a particular affinity for the phosphate of lime and calcareous salts of the dentine, dissolving them and leaving the animal portion there.

In regard to the discoloration of the dentine by the presence of amalgam, you will generally find in old-fashioned amalgams, containing a large proportion of silver, the greatest discoloration. In that case, the silver has been oxydized, and combines with the albuminous portion of the teeth, forming an albuminoid of silver. I have noticed in amalgams containing a large proportion of tin, that there is not the same amount of discoloration that there is with the old-fashioned amalgams; and also, where tin is a constituent, that the shrinkage is less than otherwise. But I do not advocate amalgams, and I rarely use them. I have seen many a good gold filling rendered entirely useless by the presence of an amalgam filling in its vicinity. Where the secretions of the mouth are acid, we find the most difficulty from amalgam. In certain cases where there was considerable sensitiveness I have taken a little of the silicate of soda, varnished the cavity inside, allowed it to dry, and then touched it for an instant with a little sulphuric acid and water, and then carefully wiped it out, leaving a film of the silicate inside the cavity. Then washing it out afterward, I have inserted the filling and no sensitiveness remained. We protect the cavity in that way by means of these little portions of silicate around the filling. It is perfectly insoluble, and there appears to be no direct contact between the gold and the dentine. This remedy was suggested to me by some experiments I had been trying in frosting glass.

Dr. Taft: I have been exceedingly gratified at the remarks of Dr. Palmer, though he does not go so far as we would like to have him go. I regard this branch of so great importance that I think every man ought to endeavor to do something towards its advancement in the way of investigation.

Now, it may be that hitherto amalgam has not answered the purposes for which it was used, as it should have done; indeed, I very much doubt whether it ever will be brought to any great state of

perfection; whether the requisite knowledge concerning its properties and management will ever be attained to enable us to so use it as to answer reasonable expectations, but if it is to be used, we should understand it as thoroughly as possible.

This material has, however, been very imperfectly understood by the great mass of the profession employing it. "Dental depot men have told me, within the last two or three months, that they are selling largely increased quantities of amalgam." That remark has been made by those purchasing when asked, "Why are you using so much amalgam?"

The articles upon this subject, submitted at the meeting of the New York Odontological Society, December last, let in new light in this direction. Those articles, if they prove anything, prove that amalgam is an unfit material with which to fill teeth. Take, for instance, Dr. Cutler's article. Each of the compounds with which he experimented he found unfit to fill teeth with. The other experimenters, in the same direction, arrived at very much the same conclusions. It is true that the scope of these experiments is somewhat limited. The direction in which Dr. Palmer is experimenting was not touched, or was barely touched, by them. Physiological influence, and the diversity of that influence upon different individuals, was not referred to at all. Now, these are the great subjects. It is not merely whether the amalgam will contract in the mouth, or become dark colored. The real question is involved in the principles laid down by Dr. Palmer.

The chemistry of bleaching teeth is an important subject, and one which is but very imperfectly understood. If a practitioner finds something which, in a given case, brightens a dark hued tooth, he thinks he has something that will effect that change in all teeth, leaving out of view the varying condition in which we find them, as well as the character of the union producing the discoloration. Now, the discoloration of a pulpless tooth is produced by various things. In most cases, when a tooth becomes devitalized, there is some change of color. This is especially the case in the teeth of young persons. In another class of teeth this change takes place on account of a change of the soft-solid substance of the tooth immediately after its devitalization, and the larger the amount of such

material in a tooth, the more definite will be that change of hue when it takes place. In this state of things, its restoration to its original color is a difficult matter. If the discoloration depends upon the presence of some coloring matter in a cavity, in some kinds of teeth there may be but a very slight penetration of the walls, and yet the coloring matter shines through so as to give a dark cast to the entire tooth.

In such cases it is quite sufficient to excavate the thin lamina of dentine holding it; but sometimes this is hardly practicable, and it may then be necessary to introduce chemical agents in order to decompose the coloring matter. What those agents shall be, will depend upon the nature of the coloring matter. Sulphuric acid will decompose a certain kind of coloring matter in certain teeth, but apply it for the same purpose in other teeth and it has no influence upon them. It is so, also, with cyanide of potassium, with all the agencies employed thus far. There are cases in which even oxygen itself will not reach the difficulty.

Chlorine, as has been remarked, is a great bleacher, and it will effect the decomposition of the coloring matter so far as it reaches, but if that matter lies beyond its reach in the dentine, it will not remove the discoloration. If the tooth is blackened to a great extent by an amalgam filling, by oxyd of mercury or tin, the probability is that oxygen will not effect its removal.

Dr. Rehwinkel: I was most highly gratified by the remarks of Dr. Palmer, and I thank him heartily for the result, limited as it may be, which he has laid before us. This theory explains a great many things for which I never could find before a satisfactory solution. In looking over the results of my work for the last fifteen years, in cases where I have taken every precaution that I knew of to insure success, I have found inroads upon my work which I could not account for. And I have frequently been impelled to ask, "Why is it that the filling is there, and the tooth has left the filling? Why is it that apparently the closest joint has been undermined?" The filling remains good sometimes for years, and then all at once a morbid action springs up in the tooth, and you can see it extending rapidly. There is a morbid chemical action set up in the mouth, which is destructive to every thing it comes in contact with. That may last some time, and then subside of itself.

Another question I have never been able to solve satisfactorily is, why tin, in certain cases, is so much preferable to gold. My explanation has always been, that tin foil, or at least the oxyd of tin foil, possesses peculiar medicinal properties, arresting chemical action upon the teeth.

Another question is, why, in filling children's teeth, do we sometimes succeed better by using a plastic filling than by using gold?

These subjects have occupied my thoughts for a number of years, and I cannot express my gratification at being put upon the right track and confirmed in my theory that these changes depend not only upon chemical action, but upon another force less understood in its operation.

I come now to the question of amalgam, one which we ought to touch lightly and with kid gloves. The experiments of Dr. Bogue and others have shown us that an amalgam, to be of any use, must stand upon its own merits, and not depend upon the reputation of the maker. Through those experiments we know definitely, in regard to the contraction in different kinds of amalgam, as to which is preferable in other respects. But I should be sorry to see amalgam raised to much dignity as a subject of discussion, for fear that it might extend its use. While there are some practitioners in whose hands it is safe, it would be very unsafe in the hands of the great majority. If we discuss and recommend this or that amalgam, it will prove in operative dentistry the same curse that gum has proved in mechanical. I am not going to say that amalgam should not be used at all. On the contrary, I would sever my connection with an Association forbidding me to do so. I want to be untrammelled in the matter, but in using it I shall always want to know thoroughly the grounds of my choice.

Dr. Hunter (Mich.): I am practicing in a small town of 1,500 inhabitants, where the people have been taught by traveling dentists that amalgam is as good as gold. These men will work for half price, and they tell people that gold is only used in front teeth for the sake of the looks. I have myself become disgusted with amalgam, and have put in but one filling of it since 1874; but some of my patients have left my office never to return because I declined to use it. These difficulties, which are encountered in a small town, are well worthy of the attention of the Association.

Dr. Daboll: Several years ago I had under my eare one or two patients who had spent some time in Germany and been under the eare of Dr. Abbott, of Berlin. In the third molar in each of these patients I observed a peeuliar filling. At the time I could not understand why it was put there, or what the eombination was, although, as near as I eould ascertain, it was a eombination of gold and tin. The ladies eould neither of them tell me the eonditions whieh required sueh a eombination, and I did not know, until Dr. Palmer eommeneed his investigations, what the materials were, or what they were put there for. But, in reading over the minutes of the Ameriean Dental Assoeiation, of Europe, meeting at Geneva, I notieed that Dr. Abbott read a paper in whieh he stated that, in teeth where embryo ealeifieation had taken plaee—for instanee, the third molars, or the teeth of ehildren from ten to twelve years of age—he had been using a eombination of tin and gold, and had met with mueh better sueeess in preserving sueh teeth than with gold alone. He gave this as his experienee, without explaining the reason, and it was not until Dr. Palmer eommeneed his experiments that I got the philosophy of it.

I have been experimenting some years upon the teeth of ehildren, espeeially where the teeth were of a ehalky eharaeter, filling them with a eombination of gold and tin; filling the eavity about half full of ordinary tin, and finishing with gold, and so far as my observations have extended, I have found the result favorable.

REPORT

ON

OPERATIVE DENTISTRY.

By S. H. McCALL, of the committee.

(INSTRUMENTS AND APPLIANCES.)

It was thought best by your committee to make a division of their labors, each member confining himself to some special branch of the subject. A brief mention of some of the more important instruments and appliances will constitute the substance of this report.

The past year has, perhaps, been less prolific than some others in the production of new instruments and appliances, though it has witnessed some notable improvements in many of those already in use. Standing at the head of those of more recent date is the Burring engine. It has come to be regarded as an indispensable adjunct in every well appointed operating room, and its usefulness is now too well known to need any discussion.

Quite a number of styles are now in use, though the "Elliott Suspension" and the "S. S. White" are unquestionably the leading

engines of to-day. Both have been greatly improved during the past year as to the power and steadiness of their running qualities, the facility with which they can be brought into use, and the elegance and perfection of their finish. Totally unlike in principle and mechanism, they yet both deserve the title of "first-class" engines.

The hand-piece of the Suspension engine has been reduced to about one-half its original weight, and the ball at the end has been replaced by a fly-wheel attached to the shaft, which carries the bur. This gives balance to the instrument and tension to the driving-belt, at the same time increasing its momentum and steadiness. The engine has been greatly improved in other respects; but as it will doubtless be on exhibition at this meeting, any further allusion to it is not required.

The "S. S. White" engine, although one of the latest in the field, has been so extensively introduced that it has already gained a wide-spread popularity. Combining some of the good points of the original "Morrison," it brings out as its special and distinctive feature a *flexible shaft*, running through a flexible sheath. This gives greater facility of action to the hand-piece than has been attained by any other except the Suspension, while the power and speed are all that could be desired. The greatest difficulty in its use has been in running large disks, but the improved cables lately manufactured have, in a great measure obviated this objection. The spring pitman is another novel feature of this engine, and adds greatly to the perfection of its running qualities. Its new right-angle attachment is undoubtedly superior to all others, and so made that it can be applied to the hand-piece without removing the shield.

The air injector, or automatic chip-blower, is an ingenious appliance that is used in connection with this engine. It consists of a small rubber bulb or bellows attached at the upper end of the flexible shaft, and connected by a slender rubber tube with a nozzle fixed on the hand-piece. By the working of a simple mechanism at the pulley a continuous stream of air can be forced into the cavity, thus keeping it clear of bone dust and cuttings.

The "Fountain Mouth Protector," and "Ives' Tongue and Cheek Protector" are both neat little appliances to be used in connection with Arthur's disks. The former has a small rubber bulb for supplying water to the disk. This is fitted to the "S. S. White" engine, the other to the Morrison.

The Morrison engine, as remodeled and improved, claims advantages over the original form, and certainly presents a very neat and attractive appearance. Still, it probably does not come up to the standard of either of those just named.

The electric engine has come in for its share of improvements, and is very popular with some of our best operators. It seems to possess all the force required, and has the further advantage of supplying its own driving power. The weight of the instrument, and the noise produced in running it, must ever constitute some objections; while its liability to get out of order is greater than any other. Several styles are now in use.

The Pneumatic engine, although it has been pushed aside to make room for others, yet deserves a passing word of commendation. It was the pioneer in its line, and supplied in its own humble way, a want long felt by the over-worked dentist; and if it failed to do all that was expected of it, it at least opened the way for the perfection of better ones.

The "San Francisco Dental Engine" is probably the latest aspirant for public favor, and is offered for a much lower price than any other. From its description, and the cut which accompanies it, it would seem to be a modification of the "S. S. White" engine. It is designed more especially to run a dental mallet. Its extreme simplicity is one of its best features.

The equipment of burs, drills, polishers, burnishers, disks, etc., etc., which is now provided for all the principal engines, is most complete, and seems to meet the requirements of almost every possible case. Great improvements have been made in this department during the past year, and due credit should be given to the enterprising men who have brought about these results. Still, it is to be feared that many who purchase engines do not avail themselves of these advantages, but are trying to get along with only a scanty outfit. This mistaken idea of economy has caused many to underrate the real value and usefulness of the engine.

In regard to corundum disks, although they are invaluable, yet their extreme brittleness is a source of great annoyance. Dr. Bonwill has presented a disk of hard rubber instead of shellac, which he claims does excellent service, rarely breaks, and will last a long time. If Dr. Bonwill's idea is correct, it is to be hoped that it may be carried out, and that an improved disk may be put into the market at an early day.

Hickman's disk-carrier is quite a useful adjunct to the "S. S. White" engine. The occasions for its use are not very frequent, but there are some positions in the mouth which cannot, without great difficulty, be approached with a straight mandrel, which can be easily reached by this instrument.

Since the introduction of dental engines, numerous experiments have been made in trying to bring out the best motor for driving them; and the necessity for some power besides the foot is daily becoming more evident. Electricity, steam, water-power, and machines worked by springs or weights, have all been tried with more or less success.

The experiments with electricity have not been pushed far enough to warrant a decided opinion as to its merits for this purpose; yet there can be but little doubt that it will yet be made a cheap and practical motor.

Small steam engines have been made to run the Morrison engine, and perhaps others; but it is doubtful whether their advantages are sufficient to counterbalance their objections, which are quite numerous. Practical machinists and engineers might succeed with them, but their general use for this purpose is quite improbable.

The "Union Spring Motor Company," of Boston, have constructed an apparatus which is said to work well; and other machines operated by springs or weights have been tried with varying success. The ingenuity which has accomplished so much in other departments, will doubtless soon perfect something practical in this line.

To those whose offices are supplied with water, with a sufficient pressure, the water motor offers advantages over all the others. There are several kinds in use, but the "Backus Water Motor" is the only one of which the writer has any practical knowledge. A

trial of nearly a year has fully demonstrated its utility and perfect success.

Next to dental engines, in importance and usefulness, come the mallets—automatic, electric, pneumatic, and the various kinds of hand mallets. Nothing especially new respecting the latter has been brought out during the year, and there is still a great diversity of opinion among our best operators as to the relative merits of light or heavy ones. Those occupying a middle-ground between the two extremes are probably attaining the best results.

The pneumatic mallet is not very largely used, but seems to be quite popular with a few good operators. It is always ready for action, and not liable to get out of order, but the difficulty in getting rapid blows will probably constitute an objection to its general use.

The electric mallet has its warm friends, and staunch opposers—probably more of the latter than the former. It is used successfully and with entire satisfaction by some of our best operators, and is said to be more agreeable to the patient than the hand mallet, or the ordinary automatic. The extreme rapidity of its blows give it advantages not possessed by any other plugger: while the great weight of the instrument must ever constitute a serious objection to it. Some decided improvements have been made during the past year in its mechanism and working qualities, and its popularity is evidently increasing.

Your committee is not aware of any recent improvements in the Snow & Lewis plugger. It has come to be one of the standard instruments, and is deservedly popular.

The Baxter Automatic Plugger claims some advantages over other kinds, and is highly endorsed by some of our prominent men.

The automatic plugger invented by Prof. Buckingham, and recently adapted to the "S. S. White" engine, is undoubtedly the best thing in its line that has been brought before the profession. For over a year the writer has been using a plugger which, though differing somewhat in its minor details from this one, yet was so much like it in principle and mode of action that an opinion based on these experiments will apply equally well to the one under consideration. The instrument was attached to the "S. S. White" engine, and driven by a Backus water motor, and has proved a per-

fect success. The work has been easier for both operator and patient, and the packing of the gold has been quite as thoroughly done as by the ordinary process, and in much less time Patients invariably express a preference for it, and seldom exhibit any signs of flinching under its use. A careful comparison of the two instruments, and a short trial of Prof. Buckingham's, has left no doubt of the superiority of his, in several important particulars. It will undoubtedly be exhibited on this occasion, and its good qualities will be recognized on even a casual examination.

The same spirit of enterprise and ingenuity which has brought forth these large and more complicated appliances, has also been busy in inventing and perfecting those of minor importance. To describe them all would transcend the limits of this paper, and only a bare allusion can be made to a very few of them.

Quite a number of new rubber dam clamps have been devised, so that almost every possible case has been provided for.

Bancroft's clamp has a projecting wing on one side, which serves as a tongue or napkin holder.

Dr. Hickman has made a double lipped clamp, which is quite useful when one side of the tooth is broken down badly. The rubber is punched and stretched over the lip of the clamp, and then the clamp and rubber are expanded and applied both together.

Several new forceps for applying the clamps have also been put into the market.

"Jarvis' Separators" comprise a set of four neat little steel appliances for separating the teeth, preparatory to filling or applying the rubber dam. By means of a screw the jaws of the instrument are forced between the teeth, and the desired separation is accomplished immediately and with but little pain.

The tape forceps, or spring locking pliers, designed by Dr. Bogue, is a very convenient little instrument, designed for removing wedges, ligatures, etc., from between the teeth.

The new rubber dam buckle devised by Dr. Magill is quite an improvement on the old appliance, as it stretches the rubber tightly and smoothly over the lips and cheeks, without the use of weights, and so that it is entirely out of the way of the operator.

Large additions are being made each year to the already long list of pluggers, excavaters, chisels, etc., etc., till we now have an

almost endless variety of them. While this spirit of progress is to be commended, yet a too great multiplication of instruments may become a hindrance instead of a help in our operations at the chair. The dentist will generally save time and accomplish better results with a few well selected instruments, than by loading his operating stand with a great variety, which almost always confuses him. Success is not always attained by the same means, or in the same direction. The appliances that would enable one man to do good work may be entirely unfit for another, though equally skillful. From the ample field now open let each one draw those auxiliaries which will best fit him to do his duty well and faithfully.

SUPPLEMENTAL REPORT

ON

OPERATIVE DENTISTRY

By C. S. STOCKTON.

Mr. President: A word of explanation. I regret the absence of the chairman, Dr. Geo. H. Cushing, who is so well qualified to make the report on operative dentistry; and this regret is intensified, as there has been a misunderstanding in the committee in regard to the division of their labors. Being the last one upon the committee, I consented to prepare a short paper upon dental appliances. Since my arrival here the paper of Dr. McCall (just read by me) came into my hands, it being a very full paper upon the same subject; hence, there is no report proper upon operative dentistry.

It is a law of nature, unchanged and unchangable, that the gratification of one want brings another to take its place; and this is singularly the case in regard to the wants filled and unfilled by dental appliances. With the introduction of the rubber dam the thought was, now has dentistry become easy. But the spirit of the age has seized upon the professional mind, and invention is the thought of to-day.

What we have now in this line is far beyond the wildest dreams and anticipations of the first projectors; yet to-day ambition is just as active, and complaints a great deal more numerous than when the first dental engine started on its experimental "bore."

We desire speed and safety, better work and less labor. Unrest and haste are every where. We are always in a hurry to accomplish the given task. Invention is apace with the thought, and to this end I call your attention to the electro-magnetic mallet. No stronger language could be used in favor of any human device than that employed by Profs. Truman, McQuillen and Arthur, and Drs. Jack, Darby, Webb, and others. If we can regard their word as worthy of consideration, we must consider this instrument as scientifically amd mechanically of the greatest importance to the dental world, and second to no adjunct save the simple rubber dam. One-half to two-thirds the time is saved. The inventor has packed two books of number five foil into one filling, comprising the entire crown of a superior molar, in seventy minutes. The larger the cavity the more time saved proportionately. It is as easily handled as the pen. The pain incident to such operations is comparatively nothing. It is claimed that one-sixth more gold can be packed into a given cavity than by any other method. The most delicate walls are preserved, as well as the firmest tooth structure. The most delicate blow can be given, and the next moment the heaviest. Every pulsation is under the will of the operator. And the least of all claimed for it is that the operator is so greatly relieved from nervous and muscular loss and exertion, that a new lease of life is given him. The mallet has been very materially revolutionized by the inventor, and has been reduced about one-third in size, and is now so simple that any one can, if necessary, duplicate any of its parts. It is now almost noiseless. It is gratifying to announce that Dr. Bonwill, of Philadelphia, is most unanimously accorded the honor not only of having been the first to conceive, but to give us the first truly practical instrument; and we consider this acknowledgment no more than justice to him as a member of our profession. Let us rise to a sense of our duty, and hail the inventor as one of us, and hasten to acknowledge an instrument which promises as much in our calling as the telegraph or sewing machine in their departments.

I would also speak of the diamond (black) reamer of Dr. Bonwill. It is a very useful instrument in cutting away the palatine and lingual surfaces of superior and inferior incisors, leaving their beauty intact and enabling the operator to fill without any wedging. It can be used for the "anticipation of decay," where it is claimed an "ounce of prevention is better than a pound of cure."

Dr. T. L. Buckingham, of Philadelphia, has invented an automatic plugger, adapted to the S. S. White engine, which is a very ingenious contrivance, and a most valuable assistant to the operator who uses the S. S. White engine.

Dr. Gaylord, of New Haven, has also very greatly improved his pneumatic plugger, so that it is under the control of the operator, and the lightest or heaviest blow is given at will, and, with the engine, can be run at great speed.

My attention has also been called to the "Improved Automatic Universal Mallet Plugger" of Dr. Swartly, which is claimed to more efficiently supersede the mallet boy of "flesh and blood" than any other of the mallets.

The Backus motor for running dental engines has been improved, and is, in my opinion, the best assistant the dentist can have in his office. It is always ready, never weary, goes with the steady flow of the water, and is perfectly under the control of the operator. With it, the rubber dam and any of the dental engines the dentist may prefer, dentistry is made easy. It is our duty to ourselves, to our patients, to our families, to preserve our health and prolong our lives, and I am sure there is no one thing that will help the one and prolong the other so much as the Backus motor. With all these various appliances, we will grow young again in the practice of our profession, and will return from our vacations with overflowing delights to its welcome embrace.

DISCUSSIONS.

Dr. Taft: While I hail with pleasure everything enabling the dental operator to perform his work better than hitherto, yet I think we ought to be careful lest some of these things have an opposite tendency.

After hearing the report that has been submitted, one would think that all that is necessary is to have something to bore with. We should be careful lest we overdo in this matter, and attempt to do everything with the dental engine. I have seen some operators who thought they could do almost everything with the dental engine, and in many cases the teeth were ground, and drilled, and bored, and burred away far more than they ought to be, and with far less precision than ought to be exercised in an operation. Those who have been long in practice do not, perhaps, need a caution in this respect, but to young men such a caution is particularly applicable. They are liable, by the adoption of the engine, to fail in the attainment of that delicate and precise manipulation so necessary in making a thorough operation.

I think that while we are making appliances of all kinds to facilitate operations, we should try and make equal progress in our knowledge of the principles upon which such operations should be based. The elements of efficiency in a dental operator are not in the appliances he uses, but in his knowing how to do the work. Let us not run wild upon this subject of appliances, for there are things in dentistry of vastly greater importance, especially to the young men, than this branch of our specialty.

Dr. Atkinson: There is a department of operative dentistry that has not been touched at all, which I esteem one of the most important, and it is very opportune to refer to it now, after having heard the report on dental chemistry, and the manner of determin-

ing the operations of the change of current of galvanic action, whereby the filling of teeth is made a necessity. All that can be said in commendation of the restoration of the natural organ to complete contour by the substitution of some indestructible agent I heartily endorse. But there is behind all that a current of circulation which influences the nutrition of the teeth, which we ought to take into account.

Almost all teeth which are decayed enough to require filling at all, in some manner endanger the security of the vital action of the pulp. Many very fine restorations have been made over pulps that had only a thin stratum of dentine to protect them, which have finally died, the teeth became discolored, and the foundation laid for the necessity of this bleaching process. Something that shall be at least as poor a conductor of thermal and nutrient currents as is the dentine, ought to be substituted just as far as possible, and admit of a sufficient amount of restoring substance to complete the contour of the tooth. If a filling could be but a simple stratum of gold plate that should impinge upon the periphery of the cavity so as to exclude all chemical agencies, air, moisture, and electrical currents, I should say it was a perfect filling. I am using now oxy-chloride of zinc as a protection, and I find it very good.

Dr. Rehwinkel: Do you use the oxy-chloride of zinc in contact with the pulp tissue, or do you insulate it?

Dr. Atkinson: I prefer to insulate it, but in contact I get secondary insulation. I do not desire to put oxy-chloride of zinc in contact with the pulp tissue at all, for the reason that it has so strong an affinity for the albuminoid substances, but when this is saturated, that albumen becomes itself a protection to the substratum of the pulp tissue; but I would prefer to have the pulp covered by a normal covering—by the dentine. When not so covered, mix a solution of salicylic acid with the oxyd of zinc. This poured over the exposed pulp in a creamy condition enables it to take the form of the pulp, excluding air and moisture. Upon that apply the oxy-chloride of zinc, mixed stiff enough to afford a means of protection, and act as a non-conductor.

Dr. Abbott: There is one thing in connection with the use of dental engines which I think ought to be brought out clearly, and

forcibly insisted upon, and that is, that young men should not undertake the use of any engine, or any appliance for operating about the mouth, until they have first learned to manipulate with the utmost skill by hand. They should first be well grounded in all the principles of their art. They should study the anatomy of the teeth thoroughly; understand exactly the size of the pulp of the tooth, and its shape, so that they will know where and how much they can cut without exposing it.

In reference to this bleaching process, that brings us back to the subject of amalgam. I do not believe that amalgam, or any of its constituents, enter into the substance of a live tooth. I do not believe a live tooth is discolored by it. I believe it is the dead tooth. And what discolors it? It is not the amalgam; it is the decomposition of substances in the tubuli of the tooth.

In relation to the water motor spoken of, I know little about it. The only seemingly successful thing which I have seen for running an engine, is the electrical machine. There seems to be something about that which will answer the purpose.

In relation to the capping of the pulp spoken of by Dr. Atkinson, I have never used salicylic acid in that manner, mixing it with oxyd of zinc. In this connection I desire to ask Dr. Atkinson what he makes his paste of.

Dr. Atkinson: A solution of salicylic acid in alcohol or ether.

Dr. Abbott: I wished to find out whether there was anything put between the thing itself and the substance as laid over the pulp. I believe pulps may be preserved by many different things. I know they can by oxy-chloride of zinc, applied to the pulp itself, with no substance between, with the exception of the coagulated albumen produced by the application of creosote; but I hardly think oxy-chloride of zinc is a non-conductor, at least in my experience it has not proven so. I have seen many cases where the shock caused by thermal changes has been so severe that the pulps have died. I think a thin layer of Hill's stopping serves an excellent purpose in such cases, and I always use it where I have room.

There is another idea which occurs to me in this connection. In filling the canals of teeth where the pulp in the anterior root of a lower molar is inaccessible, and the buccal roots of an upper molar

so small as to make the introduction of an instrument impossible, the operator depends upon something to seal it up without removing the substance. In such cases he will do well to use a solution of gutta percha in chloroform. First having excavated the cavity as much as possible, he takes a piece of Hill's stopping and places it over the opening into the canal, which he has previously enlarged. He then lays over it a piece of this gutta percha, after warming it, and pushes on that, and it forces it into the very ends of the canals. That was practiced by gentlemen in New York several years ago, but I never saw any of the results of it until I saw them here in the hands of Dr. McKellops, of St. Louis, who has some very beautiful specimens. I hardly think it is practicable to fill all the canals of teeth. From what I know of a great many roots, I should not consider it safe to attempt enlargement. Many teeth are spoiled by an instrument being run through the side of a root before it comes to the point which it is intended to reach, on account of the tortuousness of the roots.

Dr. McKellops: This matter of root filling came up in the Missouri State Dental Society last spring, and was then presented to the profession by Dr. Bowman, and after seeing it thoroughly tested, I went to work and prepared these specimens. The operation is simple; is done by a watch maker's broach, and the instrument does not have to go into the cavity itself. In all cavities where I cannot get in with gold, I use that. By an examination of these specimens you will perceive that they follow out the whole extent of the nerve canal.

A Member: What becomes of the pulp?

Dr. McKellops: You take that out.

A Member: When you find the nerve canals so that you cannot introduce a broach, how do you satisfy yourself that the nerve is entirely gone?

Dr. McKellops: I cannot tell. That is impossible; but I get into those roots and treat them with creosote, and thus remove any matter which may be there, as far as may be, forcing the creosote in the same way I do the gutta percha. The operation is quite a simple one. Take, for instance, the anterior root of a lower molar where the cavities are small. You first put on your dam nicely. As the chloroform evaporates it gets a little stiff and falls out; but

persevere with a fine instrument, and, the temper being taken out of the broach so that you can bend it in any direction, you will be enabled to get in a filling where you cannot see it.

A Member: What is your mode of removing the pulp from these small tortuous canals?

Dr. McKellops: I first take a fine broach, and then I take a little Sea Island cotton, which is very fine, the least fibre of which, wrapped on one of these fine broaches, and introduced into the canal and reversed, will generally bring out with it almost anything which may be there. If you barb an instrument you will be apt to break it, but with this little bit of cotton you can generally extract the pulp.

Dr. Rehwinkel: The question in regard to the protection of roots is one that has been much disputed among us for years. I have had the temerity to differ with Dr. Atkinson upon that point. You have heard me ask him whether he brings the chloride of zinc into immediate contact with the pulp, and he admits that he does, and gives a reason therefor. Now, I cannot go into the whole question; it is a little too fine for me, but I will ask you one question: Do you believe it possible that a tissue as delicate as the dental pulp will tolerate an agent of the strength of which we have no precise knowledge, because we use the fluid in the condition in which it is furnished us by the manufacturer, but which is of sufficient strength to be employed almost everywhere else for the purpose of destroying tissue? If we wish to get rid of a tissue without using the knife, we use that very article to destroy it, and frequently in tissues on the external part of the body, much less sensitive than the tissue of the tooth, we find it exceedingly destructive. Dr. Atkinson is not alone in the advocacy of this process, but if any mischief has resulted from it, he is more responsible therefor than any other man, because his word is authority; and I say that more harm has resulted from the adoption of this remedy than from any other I know of. In rare instances, perhaps, the recuperative vigor of the tissue may be sufficient to resist its effects, but in the great majority of cases it is ruinous to it. A marked peculiarity of its action is that, instead of creating a rapid decomposition in the tissue, and thereby betraying clearly its destructiveness, it adopts the old Egyptian process, and mummifies the pulp—dries

it up, so that you can scarcely tell whether you have a live or dead tooth. You come to the conclusion that the pulp is alive, simply because the tooth has kept its color. It may even respond to the thermal changes of heat and cold, and yet it may be dead.

We ought also to be careful not to take all pulp exposures as alike. We ought to admit that there is a difference in the exposure itself, as well as the pulp, and those conditions ought to govern the choice of remedies. In a simple exposure by accident or awkward use of the excavator, must you go to work and bathe that pulp with carbolic acid or creosote? I think not. I believe there is furnished by the blood itself recuperative power in the pulp to heal up that wound, just as there is in every other part of the body. Simply take it out of the cold into the warmth, as Dr. Watt would say, cover it up with a non-irritant, for which purpose I don't know anything better than the agent employed by Dr. McKellops, a solution of gutta percha in chloroform. If you use oxy-chloride of zinc, I would, even in such cases, take a thin piece of paper, or like substance, spread it with a little balsam fir, and make a covering of that, before I would use the oxy-chloride of zinc; but if the pulp has been diseased long, and shows symptoms of irritation, it may be different.

In regard to the specimens presented by Dr. McKellops, I think that is one of the best things we have ever had. It confirms what a number of gentlemen have held and proclaimed; for until within a very short time it has been held that the only proper substance for root filling is gold. Gold is not, under all circumstances, the best material for filling, far less for filling the roots of teeth.

Dr. Atkinson: I desire to make a few remarks by way of correction of the last speaker. I have been held by that gentleman to be responsible more than any other man for the introduction of the use of oxy-chloride of zinc.

Dr. Reiwinkel: That method is known generally as Atkinson's method.

Dr. Atkinson: I only wish to announce that I am not responsible for men's understanding through their elbows—I am not responsible for their misunderstanding plainly stated truth. Go to the Cosmos, March 1868, and there you will find Atkinson's method

of treating exposed pulps, and the only difference between then and now is that I then used the creosote itself, instead of the active principle, salicylic acid. I said then, in an off-hand speech: "When your pulp is exposed and your cap prepared, make a little pool of creosote over the exposure. Then take the oxy-chloride of zinc, mixed into a creamy consistency, and drop on to the pool of creosote; tap lightly, and a wave of creosote will exude on the margins so as to completely bathe all the cut ends of the dentine as the oxy-chloride creeps out gradually to the margin. Then with a twisted bit of bibulous paper dry out the excess of creosote."

Dr. Rehwinkel: The definition my learned friend has given does not cover the ground. I did not undertake to quote at all. I simply stated a thing which is an admitted fact. We all know that Dr. Atkinson indorses the use of oxy-chloride of zinc in immediate contact with the pulp.

Dr. Atkinson: You know nothing of the kind. What is immediate contact?

Dr. Rehwinkel: Pray, Doctor, do not go into your metaphysical distinctions. Now, if I put my arm around your neck, thus, (doing so) that is what I mean by immediate contact.

Dr. Atkinson: Contact of the coat sleeve, not contact of Rehwinkel!

Dr. Rehwinkel: Whether the creosote represents the coat sleeve or not, that does not make the thing any better, because the coat sleeve, in that case, is just as unfit to come in immediate contact with the pulp tissue as oxy-chloride of zinc. Now, Dr. Atkinson is a man who will present a thing most plausibly. If he does not convince you, he overwhelms you; there is nothing left of you. In misquoting I would be guilty of the meanest act. I merely stated what I understood to be his method, and asked him if he still practiced it.

Dr. Morgan: The gentleman seems to insist that in every case where oxy-chloride of zinc has been placed in contact with the living tissue of the pulp, destruction of that pulp has been the result. I know, however, that that is not so. I have been careful in removing oxy-chloride of zinc not to expose the pulp, but when I have done so I have found the pulp still living.

With regard to the specimens we have before us, they are pretty, but I fear they are not practical. I am not satisfied to fill the pulp cavity with a plastic material, because I cannot tell what I am doing. I apprehend, in a large majority of cases, especially those where it is difficult to remove all the pulp, a portion of the canal will be filled with the *debris* of the dead pulp, and some fluid substance, and in filling, that you will necessarily push a portion of it through the foramen and soft parts. That is the difficulty with any plastic material. You will drive it through the foramen out into the soft parts. The gold itself may give rise to irritation under such circumstances, though in some cases it will be tolerated. Lead has been used for that purpose, and it has been claimed that the tissue will tolerate the presence of lead when it will not tolerate gold, or any other metal. In the use of oxy-chloride of zinc, I have seen more than one case where it has been driven through into the soft parts, and given such trouble as to make it necessary to remove the tooth. If it is a case where there has been an abscess, and there is an external fistula reaching to the point of the root, you can obviate the difficulty, but in the case of a healthy tooth it will give rise to irritation, and generally require further treatment.

Dr. Abbott: I coincide with Dr. Morgan entirely, relative to oxy-chloride of zinc. I know pulps are saved when oxy-chloride of zinc is placed in contact with them, except so far as that little pellicle of albumen, produced by the application of creosote, separates them. I know they are preserved for months and years. For a number of years I kept a record of every case, and watched it closely, and out of seventeen cases I had sixteen every time that were saved in that way. In one patient's mouth I had three teeth where I capped the pulps and filled with amalgam. At the end of two or three years the young lady concluded to have them refilled with gold. I removed the amalgam fillings and found that in every one of those teeth there was a formation of dentine to protect the pulp. The cap flew off and showed that the teeth were in a perfect condition, with the exception of a little minute place where the oxy-chloride of zinc had entered in and struck the pulp. I know those teeth were alive, because I cut around them and found them sensitive all over. I know, however

that it makes a great deal of difference how they are handled in the effort to preserve them. It must be done carefully and minutely, and in such a way that the pulp will not be irritated, and treated so that any inflammation will subside, and they can be handled as well as an incision in any other part of the body. But gutta percha will not preserve the pulps of teeth for me nearly as well as the oxy-chloride of zinc applied directly upon the pulp.

Dr. Rehwinkel: I gave that as the simplest case of pulp exposure. I know perfectly well that there are cases where it becomes necessary to flood your pulp with creosote, but I do not think it necessary nor wise to flood the freshly exposed pulp with creosote. You may get a good deal of albumen, but you do not get what you want.

Dr. Abbott: I get exactly what I want with creosote. With this coating of albumen I prevent any exudation of material through it into the cavity. This capping over the pulp retains the fluid there. If you put the cap on and leave an opening there, in a short time it will fill with fluid from the incision made in the pulp, and very soon produce irritation and destroy the pulp. This coating of coagulated albumen is just the substance we want, to prevent the thing. It will heal kindly under that.

Dr. A. O. Rawls: Before I proceed in the other branches of the subject, I wish to state to this Society the process which was given to the Kentucky State Dental Society, by Dr. Peabody, of Louisville. He once had occasion to fill a nerve canal, when he found that he had nothing to fill it up with temporarily, as he was accustomed to do, but a bit of lead. He therefore made a bit of lead wire and ran it down the nerve cavity, and left it for the time. It was a tooth which he had been working on for some weeks, where he seemed to be unsuccessful in getting it in a condition to bear stopping. He found, after this wire had been in a week, that the patient was not troubled by it. He let it go still longer, and found that no difficulty whatever arose from it.

This experiment was so successful that he continued it, and each case being attended with the same satisfactory results, he at length adopted the method in his practice. He uses nothing but lead; getting the shape of the canal as near as may be by means of cotton on a broach, he makes a lead wire as near that shape as possible,

and puts it down as far as possible, and leaves it there permanently. I am only giving you his method. I do not think it quite as good as Dr. McKellops', but the lead seems to produce some kind of therapeutic effect which nothing else has done, more particularly upon those teeth where there is a tendency to chronic inflammation, or a peculiar irritability of the parts, which will not bear the least pressure from any foreign substance.

Dr. Atkinson has advanced the theory of the application of the oxy-chloride of zinc in immediate contact with the pulp. This, I think, is correct practice as he uses it. It will not, of course, do in all cases, any more than certain strong remedies will do with the weakest and most susceptible patients under the influence of any other disease. I think with a few patients the oxy-chloride of zinc can be used in its pure state, and yet I think there should be the utmost care exercised in all cases. It is a question in my mind whether the application of carbolic acid or creosote, or any escharotic, to the nerve and dentine is advisable. In the first place, the action of the escharotic is to astringe or draw up the point of exposure in the centre, and project it through the opening. And then comes the question, is this carbolate of albumen soluble in contact with the live tissue of the teeth? Will it be taken up, or left *in situ?* Strangulation will often take place from a puffing up of the central part of the pulp in contact with the ragged edges of the exposure. Something should be used in these cases which will not be an irritant in any particular, nor an escharotic. We want, first, something to come down in contact with the pulp—a good non-conductor, which will resist the encroachments of the superadded material. If plaster of Paris had sufficient durability it would be better than oxy-chloride of zinc, or anything in which there exists an escharotic property. To make a direct application of the chloride of zinc to an exposed pulp, would be ridiculous, and success is also very doubtful where we use a large amount of material between the capping and the exposed portion of the pulp. The nearer we can bring this capping to the pulp without danger from its escharotic principle, the nearer we come to success.

I believe it exerts a rather beneficial influence where you allow it to touch the open tubules; in so far as it is antiseptic in its properties, it will exert a beneficial influence toward stopping the

further disintegration of that tissue. As has been mentioned heretofore in connection with the subject, a chemical decomposition takes place. Even though a filling be gold, there is a constant tendency to that, and anything that will protect these open tubuli will be a benefit, no matter what filling is put in. Now, I believe oxychloride of zinc will exert a good influence if you can carry it only so far as to protect the open tubules, and not allow it to come in such close proximity to the pulp as to cause death to that. I think Dr. Atkinson's treatment is nearly correct, but he does not define particularly the cases wherein this treatment will do, and where it will not. I think, also, that Dr. Rehwinkel's remarks were very much in place, inasmuch as they refer to a class of teeth whose structure is loose and open, wherein the chloride of zinc penetrates to a great depth. And these cases constitute the larger part of the cases in this direction. There are few cases coming to us for treatment, and especially those where the exposure is large, which will resist a sudden and complete application of chloride of zinc, even though you put carbolic acid or creosote in contact with the pulp first. I believe, in these cases, we can remedy the effect of the carbolic acid on the pulp by using salicylic acid instead, which is, as Dr. Atkinson said this morning, really the active principle of creosote. Use it in contact with the tissues of the mucous membrane in any form you choose, for instance, with glycerine, and apply it to the gums for a few seconds, and you will find there is a coagulation of albumen just the same as though you use the creosote itself. It is a non-irritant, and has also the same antiseptic properties as pure carbolic acid. If the capping is held off the nerve by any substance, or has any tendency to disintegration, you are not safe, for a slip of the instrument, or a little undue pressure on this or that part of the capping may cause a breaking away, and you cannot apply the capping material in sufficient quantity to overcome the power you have to use sometimes in putting in a gold filling. And in putting in amalgam fillings over these cappings, you will produce death of the pulp almost invariably, unless you allow that capping to completely crystallize and dry, so that there will be no chloride of zinc left in the capping to unite with the mercury. I believe the action of this is by the formation of either the bi-chloride of mercury or calomel, and I believe it penetrates through the capping

material often, and destroys the pulp. I believe oxy-chloride of zinc is valuable as a filling for the roots of teeth. Mixing it in a creamy consistency with fibers of cotton, it will penetrate all the fibers of the cotton so as to completely preserve it, and make it antiseptic in its properties. Working this down as near the apex as you can, it exerts an antiseptic influence upon the open tubules in the canal. Much depends upon a correct diagnosis of the case. I believe that in very many cases pulps of teeth are capped over when the operator has not the least idea in the world of the physiological condition of the tissue, and much less of its pathological condition. But it is a simple matter. We know that when a pulp is exposed it is in one of three conditions; determination of blood to the part, congestion and inflammation, or suppuration and death. Those cases where the inflammation has reached its height, just before passing into suppuration, are the most troublesome, but even such cases are generally amenable to treatment, and I think in very many cases the pulp is sacrificed when it should not be. I think sometimes you may cut down one-half the entire length of the nerve canal, and, leaving a shoulder, apply your capping, and have more chance for success than if the pulp had been exposed in a simple manner, from the fact that you have not the same trouble to contend with in the way of strangulation. The remainder of the pulp is confined in a perpendicular cylinder, and there is no chance of strangulation.

Dr. Butler: The report on Operative Dentistry is merely an essay upon machinery and appliances, and if we have got to that point where we must practice dentistry by machinery, we may as well be call machine men.

Patients, so far as my experience goes, are not fond of being made a machine-shop of. It is true that some of these various appliances enable us to work more rapidly, but it is very inadvisable for young operators to adopt them in all cases, for if they do they will never learn to cut upon living tissue as they should. It is claimed that a filling can be packed more rapidly, effectually and thoroughly by machinery than otherwise. I believe there have been more poor fillings put in within the last ten years by over packing than under packing. They have been packed to death. The gold has been packed not only so that it is not tight, but it has

been packed so much that the walls have been powdered, though, perhaps, imperceptibly. We have been talking of the chemical effect of metals upon the teeth. It is not chemistry at all. It is your miserable mechanics to a great extent. The excessively adhesive or hard gold requires a great amount of force to bring it down to anything like impinging upon the wall, and no tooth structure can resist the continuous concussion from the automatic mallet necessary to carry the gold down so that it will impinge upon the walls, without being powdered.

I say, therefore, that this machinery does damage even in the hands of the best of us. No man can regulate and apply the force as delicately and precisely with an automatic or electric mallet as he can with a hand mallet. In using the hand mallet he readily feels that peculiar rebound which indicates when he has gone far enough. I simply desire to call attention to the fact that we may be overdoing this thing.

There is another point to which I would refer. I cannot conceive that there is any advantage in using gold and tin mixed up indiscriminately and packed into the cavity. We claim that in order to get chemical action we must have two metals. Now, shall we mix them up in one cavity so that they will receive the action of the fluids of the mouth upon them indiscriminately, and say they are just as good as either tin or gold alone? I think not. If you cut so as to have a clean wall, no matter if the sutures be fine, you need have no fear about the filling standing well. If you examine carefully you will find that in these soft teeth the sulci are deep, and run out fine, and it requires care to stop all these crevices, but if they are cut out and well filled with tin, you will have a better filling than if gold and tin together were used.

Again, there has been a great deal said here about the exhaustion experienced by operators in performing their operations. As a rule, we have to spend too much time getting ready when a patient comes to us for treatment. If we were more careful to have things ready and prepared beforehand for operations, we should economize our strength a great deal.

Dr. Abbott: There are several things I desire to say. In the first place, I want to speak of this villainous subject of amalgam. There are amalgam fillings that do good service. In the hands of

a great many men I would rather they would use amalgam for me than gold. There are so many thousand men who cannot properly fill teeth with gold, that they had better use amalgam, or rather gutta percha, for that is the material that will do the best service. I do not advocate the use of amalgam, nor do I use it often. Once in a while, however, I find a tooth which is better saved by its use. For instance, where two-thirds of a molar tooth is gone, it is desirable to save it, and yet not subject myself to the fatigue of putting a gold filling there. And I believe, in such cases, I can do a better piece of work than I can with gold.

In relation to the idea of hard labor, of which there has been so much said, there is a good deal in it, but there is one practice with which I greatly disagree, and that is working and eating late at night.

I believe, with Dr. Butler, that it is hammering gold against the walls of a tooth that produces this chemical change. The attempt to condense hard gold against weak walls is what does it.

Dr. Flagg: Somehow or other it seems to me as if I have been, during this day, in a state of partial somnolency, gradually going into a continuation of those experiments in sleep which I have been carrying on for fifty years. I woke up and found somebody was talking as somebody did years ago, about running wires down tooth canals, and I dozed again and found somebody was talking about a time still further back when they had some other arrangement, and then I woke up thoroughly and found it was 1875, and that I was just exactly where I was twenty years ago. I heard one good friend talking about treating exposed pulps with oxy-chloride of zinc, bathing them in creosote, and saying he knew they were alive because he examined. One gentleman says it cannot be done successfully. My friend Rehwinkel says he cannot manipulate oxy-chloride successfully. And why? He has not the manipulative skill. I suppose he knows that as well as I do. But what can he do? He can work gutta percha. I say that takes skill. It is spoken of contemptuously, but there is not one man in a hundred who can work it skillfully. Do you suppose that a man who can work oxy-chloride of zinc and save pulps, can always work gutta percha and save them? No, sir. One man is skilled in work-

ing oxy-chloride of zinc over waves of creosote, and another in working gutta percha without any such waves.

Now, why does Dr. Atkinson use salicylic acid? The reason is merely because it is the latest and last suggestion in that way; the omega number three, and that omega will last with our good friend until omega number four is presented. I suppose I have made as many experiments in the direction of saving pulps as any other man. I have saved an everlasting lot of them, and an everlasting lot of them have died. I have saved them under plaster of Paris; and I have found that to be a very nice article indeed. I have saved them under a little piece of cotton dipped in carbolic acid, and sometimes in tannic acid. I have gone on *seriatim*, using every appliance and method that came to my knowledge. It has been my aim in writing upon this subject to note the various results which attend the application of a remedy to the varying conditions we find in the teeth.

It is very easy to say "I fill certain teeth with amalgam," and it is very easy to ask a definition of the cases, and quite hard to give it. In one of my articles, not long ago, after having explained exactly what kind of teeth I would so treat, I said: "These are the teeth in which gold fillings generally fail on the proximal surfaces in a few years." And here I take the whole profession by the beard. I do not say the operations of ordinary operators, but of such gentlemen as I see before me. And I say, without fear of contradiction, that such fillings will fail, notwithstanding they are put in as our good friends Butler or Abbott put them in.

Now, gentlemen, in this question of capping pulps, it seems to me that there is something more to the matter than what has been pointed out. You will be surprised, perhaps, to hear me say that I think the climatic conditions of the place in which the patient lives constitute an important element in the question of treatment; then the temperament of the individual, and lastly, the particular systemic condition of the patient just at the time of treatment. With a patient who, temperamentally, is disposed to recuperation; who is in fair physical condition, and living in a section of country where the atmosphere and surroundings are generally recuperative, in a majority of instances, by the use of either oxy-chloride of zinc or gutta percha, even with ordinary manipulation, you can save the

vitality of an exposed pulp. But if you have a patient in a low, retrograde condition of health, systemically weak, with a soft tooth structure predisposed to decay, and in a climate favoring those conditions, I do not think that oxy-chloride of zinc, with any amount or degree of delicate manipulation, is going to do much toward preserving that pulp. Now, we try, in Philadelphia, and we signally fail, and I confess, for myself, that I am unable to save sixteen out of every seventeen cases presented to me. I am almost afraid the order should be reversed. But I am in correspondence with gentlemen in different parts of the country, and besides I find from observation, that teeth which a certain treatment makes perfectly easy and comfortable in Boston and other places, when exposed to the climatic influences of Philadelphia, are often very troublesome. And in such cases I have had frequently to undo the work entirely, filling the tooth temporarily, and sending the patient away with a recommendation to some good operator of my acquaintance, with whom I communicate, stating the facts, and asking him, if he finds the teeth in good condition, if he will do me the favor to refill permanently, adapting his work to the patient's surroundings.

I don't believe in saving shells, but when tooth after tooth has been broken down, and the person has but one or two shells left to masticate with, certainly they are all the more valuable to him. And those are the teeth which I fill with amalgam. A lady was in my office a short time since, who came to me eighteen years ago with two wisdom teeth which she wanted extracted, so as to introduce a section piece. I told her I thought they could be saved a few years more. I made the attempt with amalgam, and those two teeth were as good last week as they were eighteen years ago.

And now, gentlemen, in regard to another subject. About eleven years ago, as near as I can remember, we began experimenting with creosote and oil of cloves. As year after year went by, in my experiments I systematically reduced the creosote, until about five years ago I found the creosote and carbolic acid had disappeared, and the cloves had the ascendency. Since that time I have been conducting a series of experiments with the oil of cloves. I bathe the bottom of my cavities, and my exposed pulps with it, and I

place my oxy-chloride of zinc over this wave of oil of cloves, and I find many of those teeth do well. A vastly larger portion are saved so than are saved under creosote. It is a soothing application. It is not an escharotic or irritant; it does not make a carbolate of albumen.

A MEMBER: Is it the light or heavy oil of cloves?

DR. FLAGG: I was not aware there were two kinds. I simply ask for oil of cloves, and with my natural instinct I always ask for the best. I think it must be the heaviest.

A MEMBER: The light oil of cloves is the best.

DR. FLAGG: Then it is the *light* oil of cloves. Gentlemen, let me ask you to try it. I want you to know it is a potent pain reliever. I want you to know that if a first-class insect of the stinging kind punctures you violently, which occasions excruciating pain, if you take a little of the *light* oil of cloves, and put it over that bite or sting, that the pain will be removed in the course of a few minutes, and if you make that application in the course of two or three minutes, two or three of them will be eminently curative, and you will say, "go away, wasp!"

REPORT OF THE COMMITTEE

ON

MECHANICAL DENTISTRY.

F. H. REHWINKEL, Chairman.

With a consciousness that a report upon the status and progress of the mechanical department of our profession will fail (owing to the absence of new and startling discoveries, either in methods or materials) to command general interest, your committee would hesitatingly offer a few thoughts upon the subject.

Judging from the manner in which the reports of former committees have been received by this and other Associations, and the apathy shown during discussions concerning matters relating to this branch, we are forced to the conclusion that mechanical dentistry has ceased to be popular with the profession; nay, more, that the existing union of the operative with the mechanical department is looked upon by a few of its members as a clog to the full development of either branch, and that, in the opinion of some, the separation of the two will be but a question of time.

Under these circumstances, your committee might have been considered excusable had it limited itself to simply recapitulating, in

substance and form, reports of former committees, merely adding such changes and improvements as have been developed during the past year in this department, abstaining from comments regarding its status and relation to operative dentistry, and its claim to full fellowship. A little more comprehensive, however, is the conception of this committee in regard to its duty in this connection. In looking for the causes which have led to the changed condition of things, the question presents itself, whether this stand-still, or rather retrograde movement, is not, in a great measure, due to the introduction of cheap bases for artificial dentures, together with the almost total displacement of platinum and gold, and the consequent want of demand for that higher grade of skill requisite in constructing plates of these metals? But is it right that mechanical dentistry should depend for a reputable existence solely upon such dentures as require the highest degree of skill—a degree attainable by but a comparatively small number? Another question, and a pertinent one, presents itself to all of us, individually and collectively: Have our societies and associations given to this branch the same fostering care and consideration which has been bestowed upon the operative or surgical departments? Have any well directed and persistent efforts been made to prevent its degenerating into a mere trade? As individuals, have we not each and all contributed towards making mechanical dentistry what it is to-day? Have we not looked upon this branch as a little less respectable than the operative department? Have we not hesitated to acknowledge ourselves mechanicians as well as surgeons? And are we not now a little too ready to abandon a field of labor honorable in itself, and offering ample scope for the display of the highest mechanical art and ingenuity—that branch of dentistry through which the most enviable reputations have been made? Are we not too willing to abandon a good half of our legitimate occupation to a class of men who would only be too well pleased with our withdrawal, and who would thank us for throwing aside this part of our profession, and yielding it exclusively to their control?

These thoughts and queries have forced themselves upon the notice of your committee. It is neither our intention or within our province to argue the points. The deplorable condition of mechanical dentistry, and the evident disgust with the present state of

affairs exhibited by many of the most honored members of our profession, justifies the supposition that, before a great while, the issue will be made on the question of a separation of the two departments, and perhaps this association will be called upon to give expression to its opinion on the subject. Whenever this crisis arrives, for a crisis it will be, it is to be earnestly hoped that a question of such exceeding importance will not be decided upon hastily, but will receive from our colleagues the most serious thought and consideration, and that they will carefully look upon it in its present bearings and ultimate consequences; considering not only how it will affect the standing and position of individuals, but also the dental profession as a whole; and not least, though last, the best good of the public generally.

With these preliminary remarks, your committee will proceed to say a few words upon artificial dentures, the materials from which, and the different methods by which they can best be constructed.

As the highest production of skill and art, a well and faultlessly made plate of porcelain stands pre-eminent. Here the maker becomes a sculptor; is untrammeled by the usual difficulties and obstacles constantly presenting themselves when using teeth of ordinary manufacture. If he is a true artist he is master of the situation, and can impart an individuality to his work otherwise scarcely possible. But the more than ordinary skill and experience requisite in the carving of the denture, together with the difficulty in calculating or making allowance for the uncertain shrinkage of these plates, (which shrinkage, unless accurately provided for, must destroy the close adaptation to the parts to be fitted) will necessarily limit its use to a few experts. Specialists can alone hope to become universally successful. Next, and really very near to the former, we rank continuous gum on platinum and iridium base; the difficulties attending the above mentioned method are considerably lessened in this, and it is therefore more practical, and also within reach of almost any one who is at all able to construct a metallic plate. Should he be unprovided with proper furnace facilities, he can certainly arrange the teeth on the plate, properly antagonize, invest and solder them, and then send them to some one who is prepared to apply and fuse the gum. The baking and fusing require much practice and experience, and can be better done by one

who uses the furnace daily. Those who have been in the habit of thus managing, acknowledge themselves much pleased with the results. There is, therefore, no reason why continuous gum work should not be much more extensively used than it is. Why do we not give to this beautiful result of skill and art our best efforts and support? Is it the fault of the people that there is so little demand for it? The answer is, decidedly, No. If a community demands rubber work exclusively, is it not because the people have been made to believe that a rubber plate is as good as a gold or platinum plate? "So much cheaper, lighter and more pleasant to wear," and, mark you, "all the style now." We all know that almost any respectable practitioner can have influence enough over his patients to introduce any kind of work, and that it depends almost entirely upon himself what kind of plates they wear. Had it not been for a few men who held on to this kind of work with unyielding tenacity, platinum plates, with continuous gum, would now be antique curiosities, admired as specimens of art of former days.

Every year we have in our midst a colleague whom we all feel proud to honor. To him—John Allen, of New York, (formerly of Cincinnati), and to W. M. Hunter, of the latter city, dentistry and the world are indebted for the practical method of producing this beautiful style of work. We name these two gentlemen as the joint originators of this mode, for it would be unjust to deny the claim of either.

Grant your committee indulgence for thus re-stating facts, well known in the history of continuous gum work, but it seems almost to belong to a time long past. Few of the young members of the profession are even aware of the existence of this style of work, much less understand the meed of praise due those who for this toiled intensely during a time extending over many months, and even years; hopes raised ending in bitter disappointments; sums of money expended in tireless experiments; until success finally attended their ceaseless efforts, and the whole profession, from Maine to California, shouted *eureka!*

In those days our colleagues felt proud when they were able to exhibit a piece of continuous gum work of their own manufacture. This style of mounting artificial teeth your committee would most

respectfully submit as the most artistic, and the very best for general practical purposes.

A combination of gold and rubber, or celluloid, will next claim our attention for a brief space of time. This is an excellent method of mounting artificial teeth, combining the advantages belonging to gold and rubber work severally, and avoiding objectionable features of either. This process being well known to the profession, a minute description is deemed unnecessary. It was protected by a patent, of which the Pennsylvania "Association for the Protection of the Rights of Dentists" became the owner by purchase, in the name of its Secretary, Dr. C. J. Essig, of Philadelphia, by whom it was dedicated to the public by order of the Association, thus rendering it free to all.

Aluminum as a base for artificial teeth has not proved as useful as its advocates, and the profession at large, once hoped. It is used but by few, and no new developments or improvements in the method of working it have come to the knowledge of your committee.

Of cheap bases, cheoplasty, introduced by Dr. Alfred Blandy, in 1855, is the oldest. This, like all other alloys, fusing at a low temperature, and of which tin forms the principal part, has never obtained a universal popularity, and although it has from time to time been much improved by different experimenters, and plates have been made of it during the past ten years which have given much satisfaction, (especially lower ones, in cases in which the alveolar ridge was almost obliterated) it does not seem likely that it will become *the* substitute for rubber.

Of the different compounds which are offered to the profession for the manufacture of these plates, that of Dr. Geo. Watt, of Ohio, known as "Watt's metal," together with that of Dr. D. S. Talbot, of Indiana, called "Talbot's artificial platina," are best known to your committee, and are, in our opinion, the most valuable.

Talbot's method of constructing cast dental plates differs somewhat from that generally adopted, and while it is more laborious, in the end gives more satisfactory results; the metal remaining bright when worn, and having but little of the metallic taste.

The improvements in celluloid as an artificial base, during the past year, have been of great value, and it is with no little gratifi-

cation that your committee feels justified in stating definitely that this style of work has ceased to be an experiment, and has become an established fact of great importance in mechanical dentistry, and promising in the future, when further perfected, to entirely supersede all other cheap bases. Among its present advantages appear the beauty and elegance of the artificial dentures when completed; the close approximation to the natural color of the gums; the extreme lightness of the plate, and, what is of far greater importance, no injurious effects upon the soft tissues of the mouth from mercurial poisoning. This last alone gives it an immense advantage over vulcanite. There are also some points of importance to the mechanician which deserve mentioning. In cases of difficult and irregular antagonization with prominent gums and alveolus, plain teeth can be used, offering a great advantage over the otherwise excellent and valuable gum teeth in sections of two and three. Again, the process of moulding and hardening the plates occupies just thirty minutes, or thereabouts, a difference in time of five to one in favor of celluloid over vulcanite. The question of strength, although at this time somewhat mooted, presents nothing discouraging, but can only be definitely settled by time. So far, all reports seem favorable. Your committee has taken pains to gather information on this point. No complaints have come to our knowledge, nor have we learned of any failures. Are we not then justified in concluding that celluloid has proved satisfactory in this respect? In order to test celluloid as a suitable material for a dental plate, one member of this committee, more than three years since, constructed an upper plate of this material for his own mouth, and from that time has been constantly wearing it. Let it be borne in mind that this plate was made of some of the first material put into market, and which is acknowledged to be much inferior to the present improved production; also, that it was moulded and pressed in the old oil tank; that it was the first plate of this kind ever made by the wearer, and that, notwithstanding all these disadvantages, it has stood the test of time, comparing very favorably with vulcanite. Now, if a plate made of inferior material has remained serviceable for more than three years, it is safe and logical to conclude that celluloid in its present improved condition, together with the superior methods now employed in moulding the plates, will be as

strong and durable as rubber. It is subject to query, whether the strength of this latter material has not been always overrated. This question of strength is the only one in which a comparison between the two products is admissible; in every other respect celluloid is, in the opinion of your committee, far superior to vulcanite.

The old oil tank is rapidly being displaced by the steam apparatus, steam being the agent now mostly employed for softening and moulding the plates. Different machines for this process are now in the market. That of the Celluloid Company, furnished through Samuel S. White, is so simple and practical in its construction, so reliable and satisfactory in accomplishing its work, and yet withal so reasonable in price, that it justly deserves its popularity. The absence of a themometer with the boiler is a source of anxiety to the novice, and is objected to by some; this want ceases to be felt, however, after using it a few times. Confidence in the reliability and the correct workings of the agent employed, and the consciousness of being able to work and handle the machine easily, will be established, and the oil tank, themometer, etc., will be discarded without regret.

Another process of softening and pressing the plates into shape is found in the application of moist heat. Your committee knows, from good authority, that this method is very rapidly gaining favor. An oven, with dry heat, so arranged that the flask can be watched during the process of closing it, without taking it out, is now being constructed. It is claimed that this last named method is superior to those preceding it. Your committee has had no experience with this mode of moulding celluloid, but from little incidental discoveries made in connection with the working of this material, would incline to the opinion that it will not only prove practical, but that it may offer advantages hitherto unattained, especially in welding one piece to another, which is desirable in repairing broken plates. Efforts to accomplish this are constantly being made, experiments are unceasingly going on, and as celluloid is only in its infancy, it is not unreasonable to suppose that it will rapidly be brought to a state of still greater perfection.

D. M. Lamb, Esq., of London, Canada, has succeeded in obtaining a vulcanizable gum from the juice of milkweed, by a process pro-

tected by patent, bearing date February 9, 1875, and No. 159,687. The originator claims great advantages over the ordinary products of vulcanite or rubber, and states that it may be used either alone or in combination with the ordinary "caoutchouc." This committee has no practical knowledge of this new material as a base for dental plates, but from its character, together with the fact that it can be used in combination with rubber, would respectfully suggest that any one disposed to use it had better first satisfy himself that he does not run in danger of infringing the Cummings patent.

F. H. REHWINKEL,
J. F. CANINE, } *Committee.*

DISCUSSIONS.

Dr. Stockton: I am much gratified to note the credit which my friend Dr. Rehwinkel bestows upon continuous gum work, and I wish especially to call attention to the dental colleges which turn out young men entirely ignorant of this kind of work. I have had young men in my laboratory to assist me, and I have almost universally found them ignorant of this kind of work. It is, however, the very best work we can do.

The report spoke of gold in connection with rubber or celluloid. I think, however, that platinum and irdium make a stronger plate, and one which can be used much thinner than gold. I have lately been making work of that kind with celluloid, and I find it to act beautifully. I would say a word in reference to celluloid manipulation. I have a new apparatus made by Dr. Manning, of York, Pennsylvania; a kind of large oven; you can go away and leave it for quite a time with the heat under it, and come back and go to work. It makes a harder plate than any other process I have employed.

Prof. D. D. Smith: There is very little stimulus in this audiance to speak on a subject like mechanical dentistry, a subject almost entirely ignored by such gentlemen as we see here. I had hoped when this subject came before the Association for discussion, that we might have a tolerably full attendance, and one representing largely the younger members of our profession. This subject appears to be kept entirely in the background, and yet there are patients upon whom we bestow the utmost care, whose teeth are crumbling away hopelessly, and the patient is at length thrown upon the hands of the mechanical dentist. And now, does it become us, as representatives of this profession, to think of such a thing as the separation of these two departments—the placing of mechanical dentistry in one category and operative dentistry in an other? During our day, at least, they are one and inseparable. And now, what is the result of our foremost dental practitioners thus ignoring this matter? I have here (exhibiting) a set of teeth which came into my hands, within the last six months, from one of the first operators in this country, who, if he did not do the mechanical manipulation, had it done under his care. And what is the result? This high representative of the dental profession in the way of operative dentistry, has violated every principle underlying mechanical dentistry. In the upper jaw we have, in the first place, a hole in the plate, which is made to meet one of the superior teeth, probably the wisdom tooth. After this plate had been worn about two years it fell into my hands, and what was the condition of it? That tooth, being loose, was thrown entirely out of line, and became a constant source of irritation to the gum. I lay this down as an invariable rule, that when we have a single tooth, remaining either in the upper or lower jaw, if that tooth has no antagonist, we must, in the preparation of that mouth for an artificial denture, extract it.

The next thing I would call attention to is the arrangement of the teeth upon the plate. Here is an arrangement which is a violation of nature's law completely. They are placed upon the arc of a circle such as is known as a horse-shoe shape. Now nature never places natural teeth in this way, and it is our duty to follow nature in the arrangement of an artificial denture. There are cer-

tain cases where they may be found in this way, but in general the dental arch, from the cuspid back to the wisdom tooth, or to the last molar, is a straight line on either side. And this is the order which we must observe in arranging teeth. In this way the lower teeth would be arranged so as to stand on the inside of the arc, and when pressure is brought to bear upon the teeth in the act of mastication, that pressure will be distributed equally on the arc of the circle entirely around, so that the plate will receive the pressure on one side as well as the other, no matter upon which side the force is applied. Now, in this set of teeth, made by one of the first men in the country, all the masticating teeth on the lower arch are thrown outside the line of bearing, and the result is, that when pressure is brought to bear upon these teeth the plate is tilted to one side.

Another point to which I would call attention is the articulation, the opposition of the superior and inferior arches. As they are brought together they are not at all like natural teeth. There are but two points at which these teeth touch, whereas the line of bearing or contact should extend from the molars on one side, to the anterior bicuspid.

I will now, by way of contrast, and illustration, present a set of teeth made by an equally eminent member of our profession, which shows the true method of arrangement. (Producing specimen) This artificial denture is arranged in the most perfect accord with the principles I have attempted to explain. A straight line from the cuspid on one side back to the molar teeth upon the same side, the six oral teeth describing the arc of a circle, and so arranged as to bring the points of bearing of the lower teeth within the circle, and distributing the pressure upon all parts of the inferior jaw.

The next point I would criticise in reference to this set is the material upon which the teeth are mounted. It is a material which is worked under a license from a company, and a set of teeth in this age of dentistry, made by a representative of the highest style of dentistry in the United States, and mounted upon such material, is certainly a subject of criticism. We read that when the children of Israel were passing through the wilderness to the Promised Land, they deserted the Lord, and also Moses, their leader, and that they made for themselves a golden calf, before which they

bowed down. And so we, as a profession, have departed from true methods, and have made for ourselves, not a beautiful golden image, but a great, ugly rubber calf, at whose shrine we have abased ourselves until the divinity of inspiration and improvement has well nigh departed from us as a profession. Many leave out of view the fitness or unfitness of the material, and take into account only the oppressions which the working of that material brings upon them. Let us throw this off, and look this material squarely in the face, and consider whether it is the indispensable thing the profession has learned to regard it. If it is, let us bow respectfully to this matter of law, but if it is not, let us throw it aside.

Dr. Stockton has spoken of the deplorable ignorance of the gentlemen graduating from our dental colleges, as regards continuous gum work. There is some occasion for this remark, but I would inform Dr. Stockton that the Philadelphia Dental College teaches the construction and importance of this style of work with greater emphasis than any other. It ignores almost entirely the construction of rubber work, pointing out its advantages, but more particularly its defects.

Dr. Abbott: Not only does the Philadelphia college recognize the importance of continuous gum work, but the New York College does also, and I presume every college recognizes it as the highest perfection of art in that direction.

Dr. Atkinson: The records of the clinical departments of our schools show more rubber than anything else, in every school I have known.

Dr. McQuillen: I presume the explanation of that is that you cannot compel the patients to take the continuous gum work.

Dr. Atkinson: The colleges can at least require that continuous gum work must be made by every student before he gets his certificate.

Prof. D. D. Smith: I would inform the gentlemen that it is required of the gentlemen of the Philadelphia school that they deposit some case on metal. We do not say that it shall be a piece of continuous gum work necessarily, but a piece of metal work must be presented to the professor of mechanical dentistry, and placed in the museum.

Dr. Barrett: Some reference has been made to the milk-weed rubber. Some kind of a base of this kind is required, I think, by the profession. That it should be universally employed I do not believe, and yet it may have its uses. As I had some connection with this discovery, and have been repeatedly applied to for information, it may not be improper for me to say a few words concerning it. I have no other connection with it than as a dentist—no pecuniary interest in it. I believe this material to be an original discovery. That such a gum existed in certain forms of the vegetable kingdom was known, but the process of extracting it was unknown until this discovery. It is obtained from *asclepias*, or milk-weed. The method is this: The common milk-weed is gathered and cured as you would cure hay. It is then cut up finely and fermented, just as you would make malt. It is fermented, and the gum rises on the surface. This is then dissolved in bi-sulphide of carbon. The bi-sulphide is then distilled, leaving the gum. No thorough analysis has been made to show what its constituents are. It is, however, different from the caoutchouc gum, more condensed, and I believe it is stronger. It is, in a measure, free from that peculiar inflammatory character which is inherent in caoutchouc gum. It was one of the conditions laid down, before I would consent to introduce it to any one, that no system of office license should be inaugurated, but that it should be sold by the pound, and the sale should carry with it the right to use it. I believe it to be a perfect substitute for the ordinary vulcanite work, not only in hard rubber, but in soft rubber.

Now, the status of the whole thing is this: A company was formed, and, instead of obtaining dividends, there has been a succession of assessments until a great many members of the company have become dissatisfied. About a ton of the gum is ready for market, but the inventor will not put it before the public until he is able to give the profession a guaranty that it shall not be subject to the claims of the Goodyear Vulcanite Co. But I believe, and I have the authority of eminent counsel whom I have consulted, for saying that it will not be subject to the claims of that company. It is a new discovery, and it cannot be covered by any previous patent.

REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

By G. W. KEELY, Chairman.

The future of dental surgery depends, in a great measure, upon the efforts now being made for the elevation of our standard of professional education.

The dentist claims his legitimate position as a member of the medical profession, a claim which that profession, (with their characteristic conservatism), will acknowledge only upon evidence of the most thorough and scientific culture. Such recognition, though desirable, is by no means indispensable. The dentist has higher aims, and recognizes profounder obligations to his specialty than to any self-constituted guild or corporation. His specialty in medicine is one which demands a high tone of original manhood, a thorough discipline of his powers by general, literary and scientific culture, and, finally, a careful and elaborate preparation for the delicate and arduous responsibilities of his calling. It is true that many burning and shining lights in the dental profession did not enjoy the preliminary education which is now felt to be an essential to the high-

est professional excellence. By virtue of untiring effort and great natural ability, they have achieved eminence and success in spite of these deficiencies. Such are the men who, enlightened by experience, would have the future members of the profession enter upon its duties unburdened and untrammeled, and thoroughly furnished with all mental requisites for their work. Such are the men who are earnestly laboring for the advancement of dental science. The assumption of its responsibilities at the present day, without far better preparation than the older practitioners enjoyed, argues a failure to comprehend those obligations, or a criminal indifference to them.

The requirements of dental practice are constantly enlarging, and can be met only by a deeper and more intelligent study of fundamental principles, and a more perfect adaptation of them in practice. The truths of the profoundest science must be embodied in the most intelligent and elaborate processes of art. Hence, dental surgery, like every other profession, demands equal facility in abstract investigation and in concrete adaptation.

These seemingly diverse tendencies, (the ideal and practical), must be brought into harmonious combination if we would bring into the profession minds capable of achieving its highest beneficent results. In the discussions of a dental society these two tendencies of mind will find special admirers, each of whom, if not careful to control their previous impressions, will be apt to depreciate the characteristics which least impress their minds. This is one of the proofs of imperfect training which, unfortunately, mars the success of men of all professions. Some are disposed to lay too much stress upon profound scientific indoctrination, supposing that the practical elements of professional character will develop themselves, or, at least, require much less effort at culture; others overvalue practical skill at the expense of fundamental knowledge of principles. Both of these extreme tendencies are to be corrected, and a system of professional education inaugurated, which shall harmonize them in the highest results. Such are the views of the leading minds of the profession. Upon the general points to be attained by professional education there is a remarkable unanimity. But as to the methods of attaining these results there are various opinions,

and a distraction of councils which is not favorable to prompt and vigorous action.

How shall dental education be conducted to secure the essential points previously enumerated? How shall minds unfit for its reception be prevented from engaging in its preparation? How shall dental surgery be relieved from the dead weight which embarasses it in common with other learned professions? Shall civil authority be called upon to prescribe professional qualifications, and to repel, by penal enactments, the intrusion of unworthy practitioners, or shall the profession resolutely refuse to fellowship with any but the worthy and well qualified? What tests of ability, talent and character shall be prescribed? What literary and scientific culture shall be demanded as a preliminary to professional training? Again, dental surgery being but a specialty of medical practice, how shall the fundamental indoctrination in anatomy, physiology, pathology, chemistry, and all other branches of a thorough medical education, be secured? Shall the regular medical colleges recognize the specialty and adapt their tuition to its requirements? Or shall the dental college call to its aid the medical professor, and thus supply the lack of basic professional culture? Perhaps both these methods will be tried, and the most eligible one be selected, after the result of experiment. The policy of maintaining dental colleges proper will, of course, continue, and we will thus supervise the qualifications of future applicants.

A practical question of great importance rises just here: Shall the efforts to establish these schools be concentrated on a few of superior excellence, or shall they be frittered away in the vain attempt to keep alive a multitude of starvelings, that may bring disgrace upon the profession, and multiply the half-taught, eager aspirants after professional honors? We have before us the very instructive example of innumerable colleges and schools in our country for general and special education, very few of which have any but a local reputation. The wretched resources of these schools occasion a destructive competition, and consequently a cheapening of academic honors, which has rendered them, in many cases, almost worthless. Even professional schools, both of law and physic, are not ashamed to underbid each other by lowering their standards of

study. The result of this fatally unwise policy has been the overcrowding of professional occupations with incompetent men.

Let us learn an important lesson from this experience. Our branch of medical practice is comparatively small, and should be kept up to a high standard of special qualifications. To do this effectually we need but few schools, and they should be of the first order. Local interests have no right to be heard in this connection, for the vital and general interests of the profession are at stake. Let the number and location of our schools be regulated by considerations drawn from the necessities of the profession at large. Three first-class colleges are all that are needed at the present time. One east, one west and one south, and, when the proper time shall come, one on the Pacific coast. For this number of schools it would be comparatively easy to secure large establishments, and permanent endowments sufficient to attract the ablest and most scientific professors, and to secure them against the necessity of daily toil for a living. The most ample apparatus for instruction and experiment should be provided, and constantly renewed when required, together with large libraries of well selected books in all departments of literature and science, as also in dental surgery. Without such endowments and equipments no school of any character can enjoy permanent prosperity. If our profession could be induced to concentrate its force on a few colleges, it would be comparatively easy to secure all these advantages. If, however, the unwise policy of dividing our forces (which has crippled other institutions) be adopted, we may expect to see the same waste of effort, and after many years of severe struggle to sustain a large number of schools, one by one will succumb to the financial pressure, leaving debts and exasperated feelings behind them. The few that may survive will not be as healthy and vigorous as though they had been nourished by the undivided care of the whole profession from the beginning. From the American Dental Association (the most influential power in the profession) should emanate the efforts to inaugurate this plan of concentration.

VOLUNTEER ESSAY

ON

DENTAL EDUCATION.

"D. D. S."

By J. Foster Flagg.

It is with no ordinary feelings that I enter upon the discussion of the subject of dental education. I stand, as it were, spell-bound, as I look back upon the vista of almost thirty years of professional life.

I had thought, until recently, that the lot of dentistry had long since been chosen.

I had thought that the deep plowshares of the sturdy veterans of the Baltimore Dental College had turned the sod for the cultivation of a new profession.

I had thought that I was one of a great, *united* band of workers, whose hearts were in their hands; whose faces had never turned back; who counted toil as naught; who worked and thought and fought for dentistry.

So full was I of this, that the old-time settlement, by medicine, of the status of the dental art had come to be a *cherished* by-gone.

Cherished as the act by which we were indeed made free; cherished as the sting which goaded Harris, Haydn, and their compeers, to such herculean efforts as gave birth to that which seems to-day incredible; cherished as the source from whence, *unwittingly*, has sprung so much development that we are justly proud of it.

All this was less than forty years ago, and even now are present those who well remember *how* it was that dentistry was born and honored with a "title."

Long and earnest were the councils when this work was done; slowly, cautiously, was each step taken; anxiously, hopefully, was launched the ship upon the waters; and nobly has it floated onward in its course from then till now.

And has it stopped? Has progress ended? Has everything been done that can be done? That now we, ever and anon, are greeted with a cry for "help!" *For help from medicine!*

In what *would* medicine give help to dentistry? In what *does* medicine give help to dentistry? In what *could* medicine give help to dentistry? I do not ask these questions thoughtlessly, arrogantly, captiously; but thoughtfully, seriously, earnestly. Medicine may be the lion, and dentistry, yet, may be the mouse; but if I well remember, it was the mouse that helped the lion. I don't just now recall the help the lion gave the mouse.

For quite a time, in years gone by, the Æsculapians discussed the worth of dentistry, and then found "nothing in it."

Nothing to give it merit worth an education *at their hands;* nothing to give it status *worthy their consideration;* nothing to give it claim to *their association.*

And now, has all this changed? Have we, by what we've done, proved merit *worth a liberal education at their hands?* Have we, by forty years of labor, made a status *worthy their consideration?* Have we, by work, by study and success, at last established claims which warrant the conferring of that "*opportunity for broader base*," which, having been accepted, shall entitle us to *their association?*

Away with this! It seems to me as more than foolish. It seems to me to taint of ignorance regarding that which we, of all men, should have knowledge of—the breadth and power of dentistry. Its breadth is such that no one *dentist* that I know hath arrived

to compass it; its almost inexhaustible power for doing good is hourly taxed and hourly *demonstrated*. No theoretic dosing, no compounding remedies for weeks and months to try first this, then that; but something done—a *something* drawn from resources so varied and diverse, that not to give it separate existence is but to stultify it.

I have no fear in the enunciation of these views; no fear that I shall be regarded as an opponent of *progress;* no fear that I shall be accused of narrowing education; no fear that I shall clog the cherished interests of dentistry; for, if my record in regard to these has not been made, I cannot now begin.

For thirty years I've watched the progress of my loved *profession*. For thirty years I've seen each year fresh proof of individuality. For all these years I've felt the *emulative* spirit, which has grown stronger and stronger in the heart of dentistry; full of a yearning for better things; full of an energy for higher works; full of a zeal for achievements which should rival those of other callings; but until now I've never heard that over all, beyond all, above all, was a great goal which could alone be reached by *loss of our identity!*

What argument is there in the *assertion* that dentists *must* be medically educated?

What truth or force is there in the *assertion* that this is a foregone conclusion?

What reasonable inference have we that this would even be *desirable*, not to say *markedly advantageous?*

Is it that our best practitioners are medically educated; and that they are our best practitioners *because* they are medically educated?

Is it that our worst practitioners are not medically educated; and that they are our poor apologies *because* they are not medically educated?

Is it not the fact, on the contrary, that many of the very brightest from our ranks are not otherwise than dentally educated? And is it not true that year after year witnesses constant accession to the number of those, who, medically educated, have felt most woefully the absence of that knowledge which alone they could rely upon?

I will not speak to you of the average medical practitioner. I esteem him as a man; I associate with him as a gentleman; I re-

spect his average attainments. Of him I will not ask, but I *will* ask of the erudite of medicine; I *will* ask who, of all their professional corps, which one, among the most distinguished of their teachers, could stand, with credit to himself and comfort to his patient, *five little minutes* at the dental chair?

And why is this—that I can ask, but none can answer?

It is because the two great branches of the healing art are medicine *and* dentistry. Medicine, first, oldest and grandest, if you please; dentistry, second, youngest and least, if you please; but none the less medicine *and* dentistry; distinct in their mixing as are *oil* and *water*, the emblematic fluids of the two professions!

Year after year the lines of demarkation have become the more apparent; methods, appliances and rules for practice which pertain to one, are unknown, unheard of, by the other; subjects may have a vital interest for the medical man and yet possess but slight importance for the dentist; while all-absorbing questions for the dentist have not that interest to the general practitioner which can secure for them even a passing glance.

It is *this* which has caused the drifting apart of the two professions. It is this which forms societies of dentists; this which gives rise to dental colleges—institutions which, with all their faults, I here assert, have done as much for dentistry as medical colleges have for medicine.

It is this which has called into being the very organization which I now address, an organization which lives only in the *representation* of dentistry, and which would die—*if it could be killed!*

It is this which has made our literature, both text-books and journals. What are they to general medicine? That they are valuable contributions to scientific information I think will not be denied; that they have been productive of an immensity in the direction of alleviation of human suffering cannot be gainsaid; and yet, what are they to general medicine? And, on the other hand, how the great volumes of medical lore have poured out, thick and fast, like volumes of smoke! And what are they to dentistry? If they but touch it, *even the best of them*, the teachings are the laughing-stock of our profession.

The medical press indulges at times in satirical criticism of such magazine articles as we ourselves are ashamed of; but I very much

doubt if they often experience, in the perusal of recognized dental literature, that pity and contempt with which we frequently view the accepted efforts of their very best men when they leave their legitimate sphere and enter upon our domain.

It is in the nature of things that this should be so. I do not believe even in co-partnership between medicine and dentistry, to say nothing of the patronizing adoption of the one by the other.

In a co-partnership, the union would be that of age with youth; it would be that of the established with the progressive; it would be that of the dictatorial with the defiant of control. It would be a *mixture*, and never a compound; a mixture well represented by a medico-dental faculty; a mixture which would indeed have to be well shaken when taken, in order that its components should appear as one united medicine.

Well do I remember, in the earlier days of my professional life, the universal tenor of the general practitioner toward the dentist in cases of "consultation." The whole bearing was that of conscious superiority. But of what did the superiority really consist? It was merely *superior ignorance;* as in the "consultation," if the patient had dental difficulty, the dentist knew something about it, while the general practitioner *knew nothing;* and if the patient had no dental complication, the dentist was aware of the fact, and the general practitioner *was not.*

Gradually all this has changed, at least with representative men; and now, from the real workers in the medical ranks, instead of consultations, or ridiculous demands, such as for devitalization of pulps in pulpless teeth, or the extraction of sound and eminently useful roots for the relief of ophthalmic irritation, we have requests for examinations and information as to whether or not there may exist any dental lesion.

This is as it should be; for, while I think we could not work as one, I nevertheless see no reason why we should not work harmoniously, and as we are working, *advantageously*, as *two; desiring no recognition* except just that to which each is entitled; desiring NO EQUALITY except that which springs from courteous intercourse and the mutual benefit we give our fellow-men; desiring no association, except as co-workers in the great cause of humanity, and

leaving to time and the efforts of each, the settlement of the "status" of the two professions.

It seems but proper that a few words should be given to the grounds upon which seem based the idea that dentistry is a specialty of medicine.

It is because a part of dentistry is devoted to the treatment of the diseases of the teeth; and because, in the prosecution of this specialty of our profession, the principles of practice are those which underlie general practice.

Equally with any other, I think, without arrogance, I may say that I should recognize this.

Having made this seemingly connecting link between medicine and dentistry my special study, and impressed, as I am, with the immense importance of its cultivation, I may be allowed to say how little, how very little, of the practice of dentistry is comprised in this.

A dentist may be, of all others, most capable in this direction. He may bring to bear upon it all the information gained from the most extended medical education. He may have all this increased and rendered useful by "*special*" dental lectures upon these subjects, and yet he may be so inferior a dentist as to be utterly unable to render all this erudition of much value to his patient, or, in much degree, creditable to himself.

A vast fund of information, experience, and practical dexterity, which can in no wise be regarded as in the least "special" to medicine, has to be drawn upon before the great good of a permanent benefit is bestowed.

Lectures upon these subjects are not called "special" operative dentistry, and "special" mechanical dentistry, because they are the embodiment of those attributes which give it the distinctive features of a "calling;" and if, in addition to these distinctive features, there have been adaptations from pathology, from chemistry, from metallurgy, mineralogy and physics, to such extent as to warrant the necessity for so liberal an education as to have invested the calling with a dignity derived from knowledge, *it is thus that we have made it* A PROFESSION.

This brings us, in conclusion, to the question of dental education. That the dental colleges, as now constituted, are all we need, no one

can for a moment think; but that any advance would be made by the engrafting of dental chairs upon medical colleges, I gravely doubt.

I do not doubt this theoretically, but from a practical knowledge of the working of the schools.

I know that the position of the dental element in such arrangement is subordinate.

What valid reason is there why dentistry should be subordinate to medicine, any more than that law or classics should be subordinate? And yet these have their distinct "degrees," though taught within the walls of one great university. It is *easy* to declare in favor of the abolishment of the degree of D. D. S., but it has been *hard* to gain for it that distinction which has already given it a recognized acceptation by the whole civilized world. What is the first practical gain in this direction? Is it so great a glory to *substitute* the D. M. D. for D. D. S.?

It is easy to say that one degree in medicine is enough, for no one will deny it; but to say that the "greater" *covers* the "lesser" is an assertion which, to say the least, is disrespectful to a degree which has earned for itself the right to be highly respected, and which is *not yet covered.*

With what arrogance has it been asserted that the degree of D. D. S. is one of partial culture! And with what sycophancy has it been intimated that the degree of M. D. is one of desirable fullness!

For me, if my degree only impresses me firmly, constantly, unwaveringly, that it *is* a badge of partial culture, and thus prevents the feeling that I am possessed of "desirable fullness," I shall never cease thanksgiving that I am a D. D. S.

Therefore, if dentistry is taught within the walls of any classical or medical university, its degree should either be M. D., with its desirable fullness, or else be D. D. S., with its respectable signification, and thus take rank with A. M., L. L. D., Ph. D., D. D., and other badges of partial culture.

But what of *our* work? As members of the profession of dentistry, it should be ours to rally in solid phalanx to the support of those means which have already done so much for us.

The sources from whence have flowed such streams cannot suddenly have dried; they must be nourished, cheered, and strengthened; not that they have not done well, but that they may do even better; not that their teachings have been lame and impotent, but that they may rival those of the best instructors in each and every department.

Our colleges, our journals, our associations, and our societies should each and all have our good words and deeds. Our intercourse should be characterized by urbanity, liberality, and, above all, *professional* courtesy. Our aim should be that individual *esprit de corps* which must result in never-ceasing progress.

We must try to cultivate unity of purpose. We must try to maintain ever in view the pathway we have thus far so prosperously trodden.

We must eschew all changes which offer us short roads to high positions, and rely unfalteringly upon the faith that *worth will win the day*.

DISCUSSIONS.

Dr. Shepard: I feel somewhat diffident, after hearing the eloquent and impassioned essay of Dr. Flagg in speaking upon this subject. I also dislike to enter into this discussion, because I happen to be, at present, unlike himself, somewhat interested in practical education in connection with our colleges. I would not have attempted a reply to any of his remarks if he had not so far departed from general statements as to attack, by name, the institution with which I have the honor to be connected. As he has done so, however, I feel it necessary to say a few words in reply. In the first place, I question the gentleman's assumption of his knowledge of the prac-

tical workings of all the colleges in this country, though he may be familiar with the workings of some of them. By his own expressions, he is manifestly ignorant of the practical workings of some of those institutions.

He says that whenever dental instructors are attached to medical universities there is subordination of the dental to the medical. This I deny. There is no more subordination of the dental to the medical in Harvard University then there is of the medical to the legal, of the legal to the theological, or of the theological to the scientific. A University is something different from an ordinary college. There is one governing board which governs all departments, and all those departments are equal. They may vary in importance, or in the estimation in which they are held by the community, but so far as the governing body is concerned, they are each equal and independent. There is no more connection between the dental school of Harvard University and the medical school of that institution then there is between the gentlemen who constitute the dental professors in a dental college and those gentlemen who occupy the chairs of anatomy in such colleges. It happens, in Philadelphia, that there are professors in the dental colleges who are also professors in some of the medical colleges. They occupy two positions; they are connected with the universities as medical instructors, and also teachers of medicine in the dental schools.

I see nothing improper in that. A man can as well lecture to one hundred as to five persons. It is simply an economy of force, furnishing to the dental student, at less expense, instruction which the dental profession are not able, or, at least, have not been willing in the past to furnish to their students. And it is to the disgrace of the dental profession that its colleges have not been endowed. Dental professors have given their labor gratuitously; furnishing their own apparatus and museum for illustrating their lectures. This has crippled our colleges, and it reacts upon us to our disgrace.

In regard to the glory of substituting D. M. D., I have not heard of any claim of that kind. With all the opprobrium that has been cast upon the change, there has never, so far as I know, been any attempt to explain it to the profession. The assumption of glory has been entirely by other parties than those who had been instrumental in bringing it about. I only know this, that the degree of

D. D. S. which I possess, and the only degree which I possess of a professional nature, is not to be found in the abbreviations of any lexicographer, although it is a degree which has been conferred for over thirty years. How frequently does it occur, also, that a dentist is asked the meaning of these initials? I say this not in any want of appreciation of its value, but it has not taken the rank it should have taken. The explanation is, that lexicographers derive their authority for their abbreviations largely from classical institutions, not from special schools.

The degree of D. D. S. has never been conferred by the Baltimore College of Dental Surgery. When the professors of Latin, in a classical university, are about to write a diploma, they must have it so written that it will stand the inspection of Oxford and Cambridge, and other classical institutions, and they found they could not confer the degree of D. D. S. They found they could not make it grammatically correct. As in theology, law, science, and everything else, things must meet the analysis of critical scholars, and the change was made for that purpose.

All we have done is to make a move in what we consider the direction of progress. We believe we are right, and we can see no reason why we should be arraigned as we have been, and accused of a clandestine and secret attempt to overthrow the system of dental education. I care not, however, for this, and I would not make these remarks, except that I thought there were some things which required explanation.

Dr. McQuillen: In the consideration of this subject, I would desire to rise superior to mere personal considerations; I would not stand here as the representative of any individual institution. I wish to be understood as standing here as the representative of education. It is true that I am identified with an institution, and that I desire to see it succeed, but above all I wish to see my profession elevated, and I wish to see the best means of education that can be brought to bear to bring about that result.

As most of you know, I am an evolutionist. I believe in the gradual development of species, and what is true of species I believe to be true of individuals, and also societies and institutions. Let us briefly review the history of our profession. But a few years ago, forty at the most, there were not more than three hundred

men engaged in the practice of dentistry, and some of these were men who had been failures in other occupations, and took up dentistry as an easy means of gaining a living. The artisan came from his trade, the blacksmith from his anvil, the carpenter from his jackplane and saw, and with little or no preparation, entered upon practice. They regarded dentistry as a mere handicraft, and followed it as such. There were, however, a few men engaged in it who had studied medicine, and had graduated with honor. They thought here was a field in which they might render service. They had a certain amount of natural dexterity, and they passed through a limited amount of training to fit themselves for their calling. These men, desirous of seeing their occupation elevated to the dignity of a profession, conceived the idea of making appeals to medical colleges for the establishment of departments of dentistry, and making those appeals, they were rejected. The cold shoulder being shown, there was but one course to adopt, and that was the establishment of an institution where they should receive education, even though it be but a partial culture. Under such circumstances they established a dental college, which met with a limited support, struggling for years with pecuniary difficulties. It eventually succeeded, however, and the Baltimore College became at length an honored and flourishing institution. This institution sent delegates to the American Medical Association. As a student of medicine, I was present when the American Association met in the city of Philadelphia. Application was made through these delegates for admission to the American Medical Association, and again they were repulsed.*

Thus, the door being closed by means of which an education was to be obtained, what was to be done? Was dentistry to fall back into the condition of a handicraft? Were its followers to be denied opportunities of an education?

Under such circumstances institutions arose in different parts of the country. And now we hear criticisms with regard to the defects of the system of instruction pursued in those institutions, and we are informed that it would be to the advantage of our profession

*[The speaker, in support of his statements, then read from the transactions of the American Medical Association for 1852, a resolution which refused admittance to the delegates from the Baltimore Dental College.]

if we could have dental departments established in connection with medical schools. If a better course of instruction can be thus obtained, I, for one, am not opposed to it. But is it best for our profession? We do not institute a course by which the student has to attend a certain number of years upon lectures, but he has no opportunity of at once putting in practice his knowledge. Every operation is done for the medical student in clinics. He is thoroughly educated theoretically, and that is all. He goes out from the college to learn the art of medicine, and woe to the community where the tyro has to practice. In the dental colleges, if the curriculum is limited, it is yet thorough.

We are subjected to criticism. We live in an age of unrest. Everything is being criticised, and out of this criticism will come a great deal of good. But if there is anything for which I have a hearty contempt it is a supercilious and ungenerous criticism—Iago criticism, innuendoes. As a nation we have been criticised. Trollope, Maryatt, and, I am sorry to say, even Dickens, have subjected us to sneering criticism. Received with the generous hospitality which only Americans know how to exercise, they went home to ridicule our institutions, and to direct attention to our miserable efforts at self-government, not recognizing our youth and the rude developments incident to it. How was it possible to find in such a country maturity of development in art, and magnificent edifices devoted to learning?

But since those criticisms were written, how marked the improvement! What was a wilderness is now a smiling and cultivated country. Magnificent cities have sprung up, rivalling in wealth and magnificence the cities of the old world. If, then, we were thus criticised in our infancy as a nation, is it surprising that our profession should not escape?

If the dental colleges are not what they ought to be, sweep them out of existence. If they fail to properly prepare the student for practice, then close them up. The all-important question is, not whether the student receives an education which will entitle him to recognition on the part of medical men, but whether he is properly fitted to go forth and serve the community as a practitioner of dentistry. If dental colleges do this, and I believe they do, they should be encouraged and supported. The best evidence of

the value of dental colleges is to be found in the leading position of their graduates at home and abroad.

We hear a great deal said about a recognition of us on the part of the medical profession. The question always arises in my mind when I hear a man making complaints of that kind: Is not the fault with the individual? A high-toned, honorable man, I care not what his profession or walk in life, is always welcomed in the best society. If he has not the culture and refinement which society demands, society, in every sense of the word a sensitive plant, closes its leaves and quietly lets him alone.

Dr. Atkinson: Our object, as members of the dental profession, is to see that that profession shall be properly educated. We must begin at the bottom. When we sow seed we do not look for blossom and fruit in the first stage of growth. We expect a low development. It is for us, by activity and research under the law of progress, to grow into higher and better methods. Foundation principles we must have. It is a mere matter of how we shall utilize the means at our command, and not continue to hug methods which have become useless and effete.

Dr. Abbott: I have but a few words to say. As every one knows, I am associated with a dental school, with which I have been for the last nine years connected. The institution I represent has been doing its work honestly and candidly. It has been, I believe, doing as good work as any dental school, whether independent or connected with a University. Not only that, but I think there are some things in which we have led them a little in point of requisites for our students. I rose more particularly to defend dental schools throughout the country—independent dental schools, disconnected with any University.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

By I. Knapp, Chairman.

Literature, in its broader signification, is the recorded expression of all attainments in every field of thought and research.

Dental Literature is creditable to a profession that, scarcely a third of a century ago, began to study the scientific principles which underlie what was at that time a purely mechanical art. Before that date, and for some years later, a single volume was sufficient to fully describe and illustrate the physical appearances of the teeth, the cases, experiences, manipulations and appliances then known to the profession.

Apparently influenced by the example of the earlier authors, some later writers have attempted to compress into a volume the literature of the profession. The result can hardly be regarded as satisfactory.

The field of observation and research is constantly widening. Pathology and surgery demand an intimate knowledge of the histology of the teeth and surrounding tissues. The many morbid

changes of the tooth pulp often cause serious maladies in contiguous tissues, not unfrequently wide-spread in their influence. Nutrition, from the earliest inception of fœtal life to the full development of the permanent teeth, and dentition, with the serious disorders so common to that impressable period of life, demand extended and careful research and thorough study. Scrofula, syphillis, struma, inherited tendencies, malaria, anæmia, and many other systemic conditions, must often be fully understood before the dentist can decide intelligently how and when to act.

Your committee is of the opinion that the time has come for the full and exhaustive discussion of many subjects from a purely dental aspect, which are now epitomized, and occupy but a minor space in our literature.

Since the last report of your committee, a work on Dental Pathology and Surgery, by Dr. J. A. Salter, Surgeon-Dentist, Guy's Hospital, London, has been published. The volume contains about four hundred pages. It is divided into twenty-eight chapters, with descriptive headings, and has also, a full index. This arrangement makes it a very convenient work of reference. It is copiously illustrated.

Dr. Salter says in his preface: "Having practiced surgery in its general and broader aspect both in private and with hospital appointments, I was * * impressed by the too narrow and circumscribed view of the literature of the specialty I had adopted. It appeared * * that eminent hospital surgeons were scarcely aware how serious are some of the maladies directly dependent on tooth disease, and how largely the pathology of the teeth is associated with morbid changes in contiguous structures."

"Warty teeth had been mistaken for exostosis of the jaw; dentigerous cysts had scarcely been recognized. * * Alveolar abscess, dependent upon a carious tooth, was attributed to necrosed bone."

"On the other hand, dentists had but an imperfect knowledge of the pathology of the teeth, the morbid changes of the pulp, and a series of hard tumors, now classed as odontomes. * * * It appeared that there was a considerable field of surgery and pathology which was open to further research, and which would amply repay the labor of investigation. * * The immense population tribu-

tary to Guy's Hospital, gave me a rich reward in cases and pathological specimens. * * * The record of these, and those furnished by private practice, have been published during the last twenty-three years." It is well to bear this in mind, as Dr. Salter's frequent claim of being "the first to discover," "the first to describe," etc., might otherwise seem unwarranted. The present volume is a digested collection of these papers, with some additional chapters.

Your committee quotes one other remark from this preface, because it is thought the author's example is worthy of imitation: "It would have been easy to have treated other subjects which properly belong to dental surgery, by compilations, but it has been my desire, as far as possible, to express views and record observations only when I could do so as the result of independent thought and investigation."

Dr. Salter's style is simple, clear and vigorous. There is an evident easy familiarity with technical and scientific terms, but they are used sparingly, and only when definiteness of expression requires it. His descriptive powers are good. You rarely mistake or misapprehend him, for he never burdens his text with unimportant details, but seizing the salient points of the subject with well chosen words, gives sharp cut pictures, which hardly need his diagrams for full apprehension. If he lacks the flowing freedom of Tomes, his style is free from the latter's prolix elaboration of details, and he seldom indulges in hypothetical reasoning, which occupies so many pages of Tomes' work.

Dr. Salter has strong and decided convictions, and the tendency of his mind is to positive assertion of his opinions, especially in the discussion of controverted questions. But generally he preserves a philosophic tone, stating conclusions with judicial candor, and he often leaves important theories with a simple suggestion or question as to their verity.

His work is not a *system* of dental pathology and surgery, but rather a record of cases and observations, arranged in logical or natural order, accompanied by histological and pathological explanations, theories and suggestions. Hence, its merits, as a whole, can hardly be estimated by comparison. Neither is it easy, in the limited space of this report, to make a digest or an analysis that would con-

vey any comprehensive idea of the work. Your committee must be content to call your attention to a few passages which illustrate our author's habit of thought and modes of investigation, and from which you may receive some impression of the general character of his work.

From his chapter on the general anatomy of the teeth, we give, in condensed form, his views of the development and histology of dentine.

He says: "The dentinal tubes have extremely thin walls * * which are scarcely visible in the hard tissue, when seen in profile. * * * In transverse section the broad brilliant ring of considerable thickness, as viewed under high powers of the microscope, is an optical illusion. * * Upon the formative pulp is arranged a series of columnar cells, constituting the *membrana eboris*, from the distal extremities of which minute tubular threads project, and as the dentine forms from without inwards, these are prolonged centripetally, a homogeneous blastema separating them, and being calcified with them. * * No other elements hitherto discovered enter into the formation of dentine. * * The supposed 'fibrils of soft tissue' in the dentinal tubes * * are the decalcified tubes themselves. * * * The minute tubules may be demonstrated just as well from the oldest as from a fresh specimen. * * The cylindrical processes appearing to project from the tubes, as described by Neuman, Boll, and others, are minute branches of the tubes, as I have myself seen; and further, the viscid contents of the tubules, after induration by chromic acid, (as employed by Boll) might readily be mistaken for fibrils. * * According to Boll, large numbers of very minute fibrils proceed outwards, passing between the ivory cells and their tubular prolongations. * * * It is probable that these are the nervous elements distributed to the dentine; but whether they pass into the intertubular substance, or, fastening upon the tube walls, are so piloted into the ivory structure, is quite uncertain. * * * It is, however, highly improbable that they pierce the walls of the ivory cells and occupy the axis of the tube."

For the observations and arguments adduced in support of these views, so decidedly pronounced, reference must be had to the text of the author.

Dentine consists of tubes and intertubular substance; beyond this, its histology, the elements that enter into its formation, and its mode of development, do not seem to be very satisfactorily made out, no two writers agreeing fully upon any one fact. Tomes finds "fibrils of soft tissue" in the tubes. He is in doubt whether they are hollow or solid. But he is exceedingly reticent in regard to the elements that enter into their formation, and their mode of development. He rejects Kölliker's views of the histology of dentine. After expressing some opinions upon certain appearances of dentine, he concludes: "That there is much to be learned upon the subject of the development of osseous tissues before our knowledge can be regarded as satisfactory."

Wedl accepts the theory of fibrils of soft tissue in the dentinal tubes, but thinks the "fibers have a corticle more dense, and a central vitreous substance." He rejects Neuman's sheaths. He says: "Dentine is developed by the calcification of the contents of the dentinal cells; * * their principal and accessory processes remain attached, and are transformed into dentinal fibers." This statement does not seem to have been well considered.

Waldeyer (Stricker, 324) accepts Neuman's sheaths, but does not believe they are calcified. It is his opinion that "the fibers are really completely solid. The dentinal fibers are enormously elongated processes of the so-called dentinal cells, or cells of the dentinal pulp (odontoblasts.)"

In careful observation of dentine in a state of development, it will be seen that a subgranular homogeneous mass occupies the uncalcified territory, separating the dentine from the cells, but the bodies of the cells are not embraced in it. The processes of the columnar cells pass through this mass, up to and in line with the dentinal canals. So constant is this relation of parts that the conclusion seems unavoidable that the cells do not receive the lime salts, but constitute the formative organ of dentine. It is equally evident that the processes occupy an important relation to the development of the dentinal canals. Being calcified together with the intertubular mass, they constitute the tubes themselves, or, as soft fibers, act as cylinders, around which the intertubular mass calcifies. The weight of opinion among recent writers is in favor of the latter theory. But Wedl's opinion is based upon what seems to be an

impossible theory of development. Waldeyer says the soft fibers can be seen in the canals; but the tube contents, when so seen, especially when stained with carmine, appear of very much less diameter than the processes present before entering the dentine. Other observations and collateral facts, which cannot now be considered, strongly favor Dr. Salter's theory of the development and histology of dentine.

Dr. Salter has an interesting chapter on secondary dentine, which he nominates osteo-dentine, dentine exerescence, and dentine of repair. In the following quotation he gives a clear, general description of the three forms of secondary dentine, and their relations to each other, and to the tissues involved:

"Osteo-dentine and dentine exereseence are not unfrequently seen in teeth that are worn and exhibit dentine of repair. Dentine of repair, however, always forms upon that portion of the pulp cavity next to the lesion, and is adherent, and in direct structural continuity with the primary dentine; whereas, osteo-dentine and dentine exerescence occur almost always toward the extremity of the fang, and the former is quite frequently detached from the remainder of the dentine. Moreover, in dentine of repair the pulp is detached and can easily be removed, whereas, in osteo-dentine it is bodily involved in the new tissue."

Again: "Secondary dentine is abundantly supplied with tubes, but they are generally obliterated by secondary deposit. It (secondary dentine) is not the result of the wear of enamel, nor of age, *per se*, but of lesion of the dentine of the primary system, which may occur at any age." "The dentine is a living tissue," he goes on to say, "capable of receiving impressions and of propagating them to a proximate organ, which legitimately has the power and the office of restoring it and repairing the lesions it has suffered. Such a view is quite in keeping with what we see elsewhere; it is not the tissue itself that is its own means of repair, but its formative organ. But in this case, how perfect is the repair, and with what clearness is carried out the idea of a *vis medicatrix naturæ*."

It is difficult to understand how Dr. Salter, after this clear and systematic statement of these pathological causes and physiological results, should fail to perceive that the elements for the formation of dentine of repair, or, at least, of amorphous calcific deposit, still

exist after the exposure of the pulp. He admits the possibility that the pulp may "resume a dentine development." He says: "When the fracture of a fang occurs I believe the pulp cavity is always opened, but at the same time the pulp is not exposed to external influences. Circumstances are present, therefore, for union of the parts, and, under these circumstances, union does really occur sometimes."

Speaking of the calcification of the pulp, he says: "The process has a close analogy to those many conditions in which irritation and increased vascularity, caused by disease in contiguous structures, issue in the deposition of adventitious matter; in this instance, as usually happens, the nature of the adventitious matter is determined by the normal nutritional affinities of the organ affected."

Dr. Salter says, in another connection: "The developmental cell is persistent, * * and remains through life, * * ever ready to resume a continued growth by centripetal elongation when the outer surface of the dentine is injured, producing 'dentine of repair.'" If these views are correct, and your committee believe they are, we have a sound philosophical and physiological basis for the conservative treatment of exposed pulps. The function of the pulp is to build up and preserve the dentine as essential to its own existence. To suppose this function to cease at the moment of exposure is not reasonable. Exposure increases the vascularity of the pulp, and excites the function of repair to a high state of activity. If properly protected, the orifice of exposure is speedily filled by a soft matrix, which soon hardens, by deposition of lime salts, into a firm, bony tissue. Thus we have another and fuller illustration of the idea of a *vis medicatrix naturæ*, so happily described in the text of our author.

The following quotation will illustrate Dr. Salter's careful habits of observation, and the tendency of his mind to draw general deductions from the facts observed. Speaking of sloughing pulps, he says: "The deep red band which I have described is occasioned by the dilatations of the vessels into ampullæ filled with clots. They form the limit of the circulation, and the dilatations are doubtless produced by the lost vitality of the vessels upon the margins of the slough; the vital contractility has ceased and the force of the blood currents dilates the thin walls, which passively yield, and the blood

coagulates. Probably the same change occurs at all sloughing surfaces, but the minute size of the tooth pulp, and the ease with which it can be isolated and examined with the morbid parts in undisturbed relation, afford exceptional opportunities for making the observation."

I refer to one other topic, because I do not recollect ever having seen it alluded to in any other text-book on dental surgery, i. e.: crushing the inferior maxillary nerve in extracting the inferior *dens sapientiæ*. Dr. Salter gives this graphic description of his first case: "It (the tooth) had barely passed the patient's mouth, when he sprang from the chair and, placing both his hands upon the right side of his mouth and chin, exclaimed, in the wildest excitement, 'What have you done? What *have* you done? You have torn away my lip! My lip is gone!' All the teeth of the lower jaw on the right side, were dead to sensation, and the area of the lip and chin supplied by the mental nerve was absolutely numb."

A case almost identical with this described by Dr. Salter, came under my observation about four months ago. I had not, at the time, seen these cases recorded by Dr. Salter. A Mrs. E—— came to consult me about a numbness and loss of sensation of the lip and teeth upon the right side of the lower jaw. She had had the inferior wisdom tooth extracted upon that side a few days before. I judge the operation was awkwardly performed, as the forceps struck the canine tooth, the first remaining upon that side, with considerable force. Mrs. E—— attributed her trouble to the violence of the blow. The parts had not healed. I passed a probe to the bottom of the socket and touching some soft body, a slight sensation of numbness was felt in the lip and tooth. The case was clear. The inferior dental nerve was crushed. Upon the fact that the nerve responded feebly under pressure, I predicted a restoration of sensation. But so far, my anticipations have been only partially realized. Mrs. E—— describes the shock of numbness as being so great as to instantly obliterate all consciousness of the pain of extraction. I noticed one peculiarity about the tooth, not mentioned in any of Dr. Salter's cases. Running across the lingual surface of the fang, about a line from its apex, was a groove of such dimensions as to suggest the idea that it might have formed a segment of the inferior dental canal. Indeed, it would be difficult to account for it on any

other supposition. If this hypothesis is correct, the accident was unavoidable in this case.

Dr. Salter's pages are replete with cases of the different forms of tooth disease and the diseases of contiguous tissues, influenced by, or the result of diseased teeth. The more obscure affections of the nerves, reflex, secondary and remote, dependent upon tooth disease, have received careful consideration and illustration. The effects of eruptive fevers, syphillis, phosphoric poison, and enfeebled nutrition incident to a crowded and poorly fed population, upon the teeth and surrounding tissues, are carefully described. Comments, theories and suggestions upon the histology, functions and pathological changes of the tissues and organs under consideration, run through the work. These are generally sound, and often suggestive of broader signification and wider application.

Dr. Salter does not allow himself to be drawn into the discussion of subjects which do not immediately pertain to dental pathology and surgery. He says very little upon the subject of dentistry proper, and that little of no value in the ordinary routine of office duties. He evidently loves his work. Writing mainly from personal observations, he presents many subjects from new points of view, often lending freshness to familiar topics. His full, clear descriptions make his work a valuable text-book for students, while the more advanced can hardly fail to read it with pleasure and profit.

The duty of preparing a report upon periodical literature, and a report upon the transactions of various societies, was assigned to other members of your committee. This division of work was understood to be satisfactory, but so far as advised, there will be no report upon these subjects.

Unsatisfactory health and the daily duties of the office will prevent more than a passing notice of our periodical literature. The desire of manufacturers to give wide circulation to the journals under their control, induces them to offer ready facilities for the publication of everything new or valuable to the profession. It is probably unavoidable that a large mass of crude, undigested, and often irrelevant matter should, also, find its way into these journals. The editors, who are actively engaged in other duties, and receive but a limited compensation for editorial work, can hardly be expected to reject

articles of little merit, needed to make up the number, to remodel communications or prepare much original matter. Sufficient attention ought to be given to editorial work, however, to prevent serious misrepresentation of a writer's or speaker's opinions. Fault is found, and justly, too, it is feared, that this is sometimes neglected, or very imperfectly performed. Still, these journals, with some acknowledged imperfections, have done a great and good work, second, probably, to no other one agency in assisting the rapid advancement which dentistry has made during the past few years. But there is room for improvement in all our agencies for educating the profession up to a higher standard of excellence.

A quarterly journal, edited by a good writer of varied and profound learning, giving his whole time to the work, aided, if need be, by paid articles, would, it is thought, be a long step in the right direction. It need not interfere with our monthly journals. They could be left to do their local work. But it could gather up and systematize scattered truths that are now floating away on our transient literature. It would become a desirable medium through which our best minds could communicate their best work to the profession. Its influence would be national, and commensurate with the ability with which it was conducted.

VOLUNTEER PAPER

ON

OPERATIVE DENTISTRY

(REPLANTATION OF TEETH.)

By W. N. Morrison.

The object of this paper is to submit a few ideas that will be of every-day practical value in every dental office in the country.

In Vol. VI, page 475, of the *Missouri Journal*, I reported two cases of replanting of teeth with the hope that other members of the profession would experiment and report cases; but, up to the present time, not more than half a dozen have been heard from, and only in an indirect way. The two cases reported were perfectly successful, and are doing good service to-day. Since then I have had occasion to resort to this practice several times. One of the cases was the first right lower molar in the mouth of a lady about forty years of age, of very delicate constitution and anæmic habit. The condition of the gums about the roots of the teeth was bad. They had receded, and a thin brown scale of tartar was quite abundant beneath, notwithstanding the patient's good care of her teeth.

This tooth had a large decay in the distal surface, exposing the pulp, and had been kept filled with oxy-chloride of zinc for a year or more. When the case came under my care there was another decay on the root below the oxy-chloride filling; the pulp in the posterior root was dead, but that in the anterior root and part of the body of the pulp were alive. The patient and her husband were anxious to save the tooth, but the operation was too exhausting for her to bear. Consequently the tooth was extracted, and filled out of the mouth, roots and crown; the tartar was removed thoroughly from the roots and the tooth returned to its place. For three or four days the patient suffered considerable pain, but in a few weeks it was comfortable and firm, and now, about five months since the operation was performed, she has a whole tooth, except the part destroyed by decay. In fact, it is the firmest tooth in the arch, which is full, and the gum has a more perfect union than it has had for years.

Another case was that of the daughter of a market gardener. The tooth was a right second lower molar, with large coronal decay, involving the pulp. The tooth had ached for a month, and she came with orders to have it extracted, which was done. She waited until an assistant had cleaned and filled the tooth, root and crown, when I replaced it in its socket, much against the wishes of the patient, who feared it would have to be extracted a second time, as well as being opposed to disregarding parental orders. The tooth gave her some trouble and pain for three or four days, but in a week was as firm as ever, and no one could tell, on examination, that it had ever been out of the mouth.

Another case: Miss P——, aged 25 years, having always remarkable freedom from sickness of every kind, and certainly free from any constitutional taint, has given her teeth unusual care, came under the care of Dr. H—— three years ago. The left superior central incisor was quite loose and elongated, perhaps 1-16 of an inch longer than its fellow, the gum no longer embracing the neck of the tooth, but discharging a whitish secretion. The patient said this had been the condition of the tooth for several years. Dr. H—— attributed the loosening to a deposit of tartar on the root, and passed an instrument under the gum, removing everything foreign to the parts, but found no tartar. Extra cleanliness only was advised, after

a few dressings of chloride of zinc. About six weeks ago the patient presented herself to Dr. H—— with the determination of having the tooth (which was ⅛ of an inch longer than its fellow, and loose) extracted, and an artificial one substituted, but was willing to make almost any exertion to save it. An impression was taken and a rubber plate made to fit and cap the crowns about 1-16 of an inch, making allowance for that tooth to be placed in its normal position. The tooth was extracted, root canal filled, and, as the socket in the jaw was not deep enough to allow the tooth to go up to its place, I took a coarse bur and bored it out, drove the tooth up with considerable force, put in the plate, and the patient was not seen for three weeks, though she wrote she was getting along quite well a few days after. Now the tooth is more firm than before it was extracted, the gum shows a better color, and the patient's appearance is much improved.

I have replanted nineteen different teeth; centrals, laterals, bicuspids and molars, all pronounced worthless or hopeless cases if treated in the mouth, and out of that number only four have been extracted the second time.

FAILURES, OR QUESTIONABLE CASES.

Another case was a right lower second molar, nearly excised from the gum and process by a thin scale of brown tartar; the pulp dead. The tooth was extracted, the roots and a large buccal decay filled with oxy-chloride of zinc; the roots were cleansed of the tartarous scale, which enveloped them within a line of their points, and the tooth returned to the mouth. That tooth was worn comfortably and did tolerable service for one year, though it never grew firm, an attachment being formed only on a part of the posterior root, the anterior bearing evidence of absorption. The case I regarded as a hopeless one from the beginning, as it had been enveloped in tartar so long that the investing membrane was destroyed.

Another case was that of a good healthy boy, twelve years old, a clinical patient before the Illinois State Dental Association, held last May, (1875.) The tooth was a right lower first molar, pronounced by all present a "gone case." Nothing could be done but

extract. Gas was administered, the tooth extracted and cleaned; the roots and pulp chamber filled with pure gold wire and oxy-chloride of zinc; a large coronal filling was built on screws, and the tooth replaced in the socket, the patient to be under the care of resident dentists of Ottawa, who were to look after and report the result. From them I have not heard, but from two or three members of the Association I did hear that the tooth was out. A brother of the boy came home soon after the boy was operated upon, and swore that no dentist should experiment on his brother. But for the untimely interference of aforesaid brother, that tooth, without doubt, would be doing good service now.

Number 2. Dr. L. C. Ingersoll of Keokuk, Iowa. Right lower first molar, with large distal decay, extending into the crown and far down on the root. The pulp had been dead for years, and the cavity had been kept filled with oxy-chloride of zinc for a long time by the patient himself. He had offered that tooth to several distinguished operators of Chicago to make some reputation on. An appointment was made to fill it next day. At supper at the hotel the writer met Dr. Ingersoll, who was dreading the operation as only one familiar with such complications can. He said, however, that he would enjoy seeing and helping to fill that tooth out of the mouth; so after supper we repaired to the office of our worthy President. The tooth was extracted with a good deal of difficulty, but the posterior root, having so little support, broke off, and also an eighth of an inch obliquely from the buccal side of the point of the anterior root. That root was enlarged on the posterior buccal border, and of such a shape that it could not be removed without breaking it or the septum between the roots. Here was a molar crown with but one root, and part of that gone; it was, therefore, decided to make a bicuspid out of it, which was accordingly done. I did not stay to see it replaced, but the Doctor wrote that his "one-legged tooth" was getting along well and does good service, except on the very hardest kinds of food, and he thinks in a few months it will not be affected by that.

Now, gentlemen, I assume the position that for all cases where the pulps are dead, or beyond restoration to vitality, or those with incurable fistulous openings (nearly always the result of imperfectly filled root canals), taking all risk of breaking by extraction into

consideration, these teeth can be more successfully treated, and more of the organ saved by treating them in this manner than in any other. The pain, exhaustion and loss of tooth substance, the frequent luxation and the continued soreness and occasional ulceration attending these operations in the mouth, fully equal the worst effects attending a case of replanting. While I would not recommend carrying this to the extent reported in the unfortunate case treated by Dr. Barker, I feel that a large number of the teeth removed by accident or through error of judgment, or for other causes, might be restored to usefulness and rendered effective organs of mastication, by determination and a small exertion on the part of the operator.

[NOTE:—At the date of going to press, (January 15, 1876,) Dr. Morrison adds: "I have had about a dozen cases since this paper was written, all with good results except one."]

REPORT OF THE COMMITTEE

ON

Instruments and Appliances

The committee on Dental Appliances beg leave to report as follows: We find it quite impossible to give any detailed report upon such appliances as have come before us, from the fact that the time given us for such examinations has been, of necessity, very short, and had we attempted any other than such a brief report as is here presented, we feel that we might have done injustice to some, and given undue credit to others. We therefore make this our apology for the brevity of our report, and, as far as possible, give only the points that are claimed by the inventors or dealers presenting the same, and not attempting, to any great extent, to give our own opinions of their merits or demerits, as the case may be; and your committee here suggest, for the benefit of those who may follow us in this extremely difficult and thankless task, that all those who shall have any new inventions on which they wish an intelligent report before this body, be requested (if possible) to send the same to this committee as long before the time of the next meeting of this Association as they conveniently can. Many things, we are well aware, are too bulky and heavy to be so disposed of, yet, if the smaller ones could be examined and thoroughly tested before the

time of making the report, it would very much relieve the committee by giving them more time for an examination of those that still remain.

Of motor powers, two have been presented, that seem, in a measure, to satisfy a demand long felt. The Bastet motor is driven by electricity, is consequently noiseless, or nearly so, and has the advantage of being portable. It is sold by S. S. White, who brought it before the committee for inspection.

The Backus water motor is a very compact, complete and cheap mode of securing the power that it seems to be capable of furnishing. It is applicable only in places that are supplied with water pressure. It can be made portable by using rubber tubing for attachments instead of the ordinary lead pipe.

In pluggers, a number have been presented as new, and others as improved. Among the former is an automatic, invented by Dr. T. L. Buckingham, designed to be used with the burring engine shown by S. S. White.

Dr. W. G. A. Bonwill presents his electric plugger very much improved, the weight having been reduced and, at the same time, the power increased. As now presented, it seems to be entirely practicable.

Johnston Bros. present Gaylord's pneumatic plugger, very much improved. As now manufactured, it is either driven by the rubber foot-bulb, or attached to the engine.

Messrs. LeVin & Swartley present a new automatic plugger which is different from most automatics in being operated by a series of levers instead of springs, thereby reducing the amount of friction required to operate it.

Dr. Corydon Palmer presents a very beautiful and complete case of plugging instruments, thirty-five in number, which bear evidence of being the result of much thought and care both in design and manufacture.

Johnston Brothers present a set of pluggers, fourteen in number, devised by Dr. A. H. Brockway, and designed to be used with the hand mallet. They are of extremely simple forms; those intended to be used with cohesive gold having smooth and slightly convex surfaces, and being without sharp edges or angles. The handles

are varied in size and style, to be more readily recognized, and to more perfectly adapt them to the work.

Several new improvements in burring engines have been made in the past year. The Bonwill engine resembles, in some respects, the well known standard engines, in the power being conveyed from the driving wheel to the tool through a shaft and flexible spring; adjustability being obtained by the shaft sliding through the driving pulley. It is very ingeniously contrived.

Johnston Brothers presented an improved "Elliott," or Suspension engine. The improvements consist of a reduction of the size of the hand-piece, a very efficient way of securing the tool, and the substitution of a fly-wheel in place of the ball, to give the necessary weight for securing the required power. This fly-wheel being attached to the shaft which carries the tool, gives great steadiness of motion. An ingenious application of the fusee movement, well known as employed in watch works, takes the place of the suspension weight, and will remove the objection which some have felt to its use.

Edson & Evans present a portable suspension engine, but it seems to us not to possess sufficient merit to receive our commendation. Nevertheless, we are free to admit that a practical trial of it might show that it possesses all the merits claimed for it.

Johnston Brothers brought to our notice a new form of extension treadle for dental engines, in which torsionary movement is applied in a very effectual manner. This is the invention of Dr. A. H. Stevens.

S. S. White presents for the notice of your committee an improved bracket and table. The bracket, by a simple and ingenious appliance, admits of being raised or lowered quite sufficiently for all practical purposes, holding itself firmly in whatever position placed. It also has a lateral motion well adapted to the accomodation of the operator.

Johnston Brothers present a bracket table, the invention of Dr. W. N. Morrison, the peculiarity of which consists of its capability of being opened and folded up like a lady's fan. When closed it serves the purpose of a small chest of narrow drawers; when open, the operator has before him an ordinary bracket table, though divided off in many small compartments.

Johnston Brothers also brought before your committee a simple device for the locking of the castors of the Morrison chair, designed to prevent its moving on the floor when placed in position.

S. S. White presents an improvement on the Harris chair. It consists in a device by which the upper section of the back may be entirely removed, thus allowing the head-rest to fall several inches lower than it otherwise would, and by this means shortening the back; also an arrangement by which the arms of the chair may be entirely removed if required.

Geo. W. Archer presented some improvements in the chair bearing his name, the principal of which is an arrangement by which a lateral motion may be given, thus allowing the chair proper to be turned completely around upon its base if desired; also an improvement by which the whole body of the chair may be raised, independent of the seat; and another in the way of a compensating spring, which, upon the chair being lowered, is wound up like the spring of a watch, but upon the raising of the same, expends the accumulated force as a lifting power.

The Buffalo Dental Manufacturing Company presented for our consideration a dental chair, the invention of Dr. Geo. E. Hayes. This chair, while it has undoubtedly been the result of much study and a large amount of inventive ability, yet, to your committee, seems much too complicated in its mechanism for practical application; it combines an innumerable amount of movements, all of which are, probably, useful, yet some of them not sufficiently so to compensate for the time lost to arrive at the result desired.

The committee have had their attention called by Dr. O. C. White to his improved dental operating chair, with attached spittoon and table bracket, and his portable head rest. The marked features of the chair, as now made, are extreme simplicity of movement, with what seems all needful range to meet the various requirements of the operator as well as the patient. With these are combined an elegance of appearance that will make it compare favorably with any of the other chairs known to us, and fit it for a place in the best appointed operating room.

The bracket is substantially what has been seen before, but with some minor improvements which make it a very convenient article to have about the chair.

The portable head-rest has been improved by the substitution of a dissecting ball and socket joint in place of the hook and eye, and this change, as it seems to us, is of evident advantage.

Codman & Shurtleff called the attention of this committee to a new dental cabinet, the invention of Dr. Cogswell. This addition to the operating room seems to us to fill a place long vacant. Its very great compactness when not in use, and perfect adaptation for the purpose designed, when in use, seem to be recommendations sufficiently strong to command your attention.

S. S. White offers to the profession an improvement in the hand-piece of the burring engine, consisting of adjustable bearings, which, being of steel, and tempered very hard, are intended to be much more durable than those generally in use. This improvement is the invention of E. T. Starr.

Dr. F. Abbott presents an improvement in the back-action hand-piece for the burring engine, which is simple in device, and should be seen to be appreciated.

R. S. Williams introduces to your notice a new and very complete device for holding his gold as prepared in either cylinders or pellets. This consists of a neat morroco case, in which are fitted glass vials, properly labeled, in which the gold is kept, thus keeping it free from exposure to both air and dust, and at the same time allowing the operator to see at a glance what he has before him.

The same gentleman also presented what he styles his "untrimmed gold;" all that he claims for this is that, by leaving the edges of his foil untrimmed, he can furnish it to the dentist at a less rate than when trimmed. This, he wishes it understood, only applies to his adhesive gold.

S. S. White presents a lamp and warm water cup. This little device is a combination of gold annealer, water heater and mouth-mirror holder, and seems to fill a place on the operating table heretofore vacant. This was manufactured from the suggestions of Dr. E. A. Bogue. Johnston Brothers also called our attention to a very similar arraugement, designed for the same purpose, known as the "Dental Factotum."

Codman & Shurtleff present an ether and gas inhaler that, in the judgment of your committee, excels anything of the kind that has ever been brought before the profession. Its adjustments are all so

perfect, and the changes for the administration of the different agents are so easily and quickly made that it is quite impossible to describe it, and it can only be appreciated by being seen.

Johnston Brothers present an improved gasometer, which is really a very beautiful and elaborate piece of dental furniture for the office, and which can be used in connection with the liquid gas, or that made in the ordinary way. It is beautifully ornamented and nickel plated, and, therefore, will not be affected by contact of the water. We believe that those in need of an apparatus of this kind, can do no better than purchase this one.

Dr. C. R. Butler's instrument for making and inserting retaining screws will, we think, be found very servicable. By their use the screw is made and cut off at any desired length.

An air syringe, improved by having a metal shield covering half the bulb, to secure greater steadiness in use, is shown. We believe it would be improved were the nozzle made larger.

A double-liped clamp, devised by Dr. F. Hickman, and intended to facilitate the adjustment of the rubber dam in difficult cases, seems to be a useful device. This, as well as the two foregoing articles, were handed in by S. S. White.

A clamp mirror, devised by Dr. E. Osmond, for the purpose of throwing and concentrating light upon the cavity to be filled, we think, will be of service. It is very simple and easy of adjustment.

Dr. O. A. Jarvis' separators, much improved over those brought before us last year, were shown. We believe they will be found of much value, especially in making examinations of teeth in crowded arches.

The Bowman-Allen clamp forceps has also been improved, it is claimed, and is thought to be now what is wanted in such an instrument.

A tape forceps, devised by Dr. E. A. Bogue—a modification of the artery forceps—will, we doubt not, be found very useful for many purposes about the chair. A spring catch holds the blades of the forceps firmly upon any object that may be seized. The foregoing articles were offered by Johnston Brothers.

Codman & Shurtleff presented a very simple and efficient tape

carrier, and inexpensive withal. Also a foil carrier, or tweezers, combining sufficient strength with extreme lightness.

A file carrier and mouth mirror, presented by the same parties, meet our approval for their simplicity and adaptation to the purposes for which they were designed.

Much ingenuity has been shown in devising appliances for mounting and carrying corundum disks. The device of Dr. Geo. H. Cushing seems to us to possess the greatest merit; by the application of the tortionary movement, as used in coupling the shafting of machinery, the disk can readily be set to run at any angle desired.

Dr. W. G. A. Bonwill's, and Dr. F. Hickman's appliances for the same purpose, have both been improved, and are scarcely less effective.

Dr. G. W. Klump's porte polisher, for use in the engine, will commend itself for its simplicity; it clamps the corundum point, or whatever may be used, firmly, and is a manifest improvement over the hollow mandrels at present used. Dr. Bonwill's chuck for securing instruments, works in much the same way.

An improved mandrel for mounting disks, by Dr. R. Huey, wherein the nut ordinarily used is replaced by a screw, is a manifest improvement.

Among other articles of equipment for the dental engine which have been brought to our notice, are Bonwill's disks, both of soft rubber and of hard rubber and corundum, for separating and polishing teeth. Also, his diamond reamer, designed to effect separation of the superior incisor teeth upon the palatal aspect. We believe these to possess much merit.

Dr. Butler's corundum points, designed for polishing, will, no doubt, be found a useful form; and the same may be said of a style of bur cut like a bastard file, which, it is claimed, will cut more readily and with less jar than the ordinary form, besides being more lasting.

A rubber "pouch bib," from the house of Johnston Brothers, designed to protect the clothing of the patient from the overflow of saliva which frequently takes place during long operations, seems to your committee to meet the end desired.

Ransom's vulcanizer and celluloid packer was presented by the inventor, whose idea seems to have been to combine two instruments in one, which seems to possess much merit as a fine piece of mechanism, but owing to the extreme difference in the modes of working the two materials, celluloid and rubber, your committee cannot see the advantage to be derived from buying the apparatus combined; for those who use the one will hardly ever use the other. Again, celluloid is clean to work, while rubber is quite the reverse. Again, the two instruments apart cost no more than the one combined.

Dr. S. B. Brown & Sons present a celluloid apparatus for dry heat, which possesses the merit of being exposed to view so that you are at no loss, at any time during the process of packing, to see at a glance how the work is progressing. It can be used either with alcohol or gas.

Geo. E. Hayes also presents a celluloid apparatus, which can be used either with dry or steam heat. It possesses the merit of being made cheaper than the one previously mentioned, which is accomplished by using it in connection with either a Hayes or Whitney vulcanizer.

S. S. White also presented a dry heat celluloid apparatus, (Heindsman's patent) which possesses the merit of being contained in a neat case, and can be opened and examined at will during the process of packing.

S. S. White presents an improved laboratory lathe with a flexible pitman, which is so compact that it can be used with equal advantage either in the laboratory or operating room. It has a neat black walnut cover, and is in no way objectionable as a piece of office furniture.

All of which is respectfully submitted.

GEO. L. FIELD,
A. H. BROCKWAY,
G. R. THOMAS,
Committee.

Pathology and Therapeutics

[There were no reports upon these subjects, but, upon motion, they were taken up, and the following discussions ensued.—Sec.]

DISCUSSIONS.

Dr. Atkinson: I have a few remarks which I wish to make to men who are competent to apprehend what I say. I think I have gone further into the apprehension of the change which occurs when physiological becomes pathological action, than most men. All works on pathology seem to treat it blindly. Inflammation is known to be a process, *par excellence*, of disease. I wish now to take up the point as to where physiological nutrient action becomes pathological nutrient action, and trace the activity as minutely and distinctly as possible, so that we shall be able to say when the nutrient dominion is remanded from one category to another of the modes of motion that constitute the nutrient activity. It is known to you that if you expose a portion of the skin and strike it, it immediately becomes white, and afterwards returns to the normal flesh color, and immediately succeeding that there is an increased amount

of redness. Now, what is the process by which these appearances make their advent? Pressure drives the neurine out, or arrests the motion of the neurine in the vaso-motor nervous system. It is well known that the function of this class of nerves is to keep up the activity of the capillary system, so that the distribution of the blood shall be equal, and find a due transference from the arterioles to the venioles. Almost all nutrition taking place within the capillary territory, the transudation of nutrient pabulum takes place in this amorphous part of the capillaries. When a sufficient disturbance of the movement of the neurine shall have dominion of the territory, a permanent relaxation of the capillaries of the part ensues, and that gives us congestion, and arrests the circulation, so that it now is remanded back to the mode of nutrition denominated cellulation, which obtains in the vegetative method of nutrient action, and if that is continued, the consolidation ceases to be of that kind. And now, it is remanded back to consolidation after the manner of crystallization. In this way we get the changes so as to form fluids first into soft-solids, and then the soft-solids into solids by the deposition of all the solids in the neighborhood which are capable of consolidation. That is one termination; but when there is not sufficient crystallizable material present to induce deposits of that kind, we will get tuberculous deposits. Inflammation is set up through the loosely held affinity of the molecular mass, by which disintegration is set up, and if that continues, gases are generated, and the absorption of the gases into the blood corpuscles constitutes dead corpuscles, which turn into pus corpuscles.

Disintegration is really chemical, because chemistry means synthesis and analysis. There are two expressions of chemistry. The one means building up and the other mode, or reverse action, is simply taking apart. And in the lowest territory capable of being remanded back to this mode of motion, chemistry seizes upon the mass, and we get corrosive pus. If there be crystallizable materials in the territory, and in contact with that sanies, the further expression of that analyzing activity of chemistry seizes upon and dissolves the crystals and lime salts resident in them, and changes the character of the sanies into what we call *ichor*, the personification of evil in tissue.

We often see, in healthy organizations, a sufficient amount of capital in the immediate neighborhood to carry on the function of the part, and tolerate this sericoid mass. This red line I call sericoid, which means small aneurisms, distended capillaries. If I am understood, I am able to proceed to the next step. Anybody who has sufficient vitality to maintain suppuration in a chronic ulcer or fever-sore, may be cured inside of four days, or eight days at the most, just as certainly as you can make a union by first intention, by taking out the tuberculous mass, or any other heterogeneous mass within the territory. And how? If you cut into that sericoid line it will bleed. Those flabby vessels, having only the amount of vitality which remains of the connective tissue corpuscles constituting the amorphous walls of the capillary system, have open mouths, and being in connection with the heart, the action of that organ prevents their contraction. Go outside of the sericoid line, and cut through the skin and go through the external tissue entirely around that line, and then treat with a solution of chloride of zinc, twenty to forty grains to the ounce. That will give you coagulation of the capillaries on the healthy side of the tissue, and allow you to operate so as to obliterate the ulcer. If the ulcer is so large that you cannot go under it, after staunching the blood, slit up and bring the tissues of the sides together so as to form a union by first intention. This sericoid line runs through the entire extent of the ulcerous cavern just as it does upon the outside, but not being so well supplied with capillaries, is full of proud flesh—fungus. You must go below the sericoid line, within the crater of the ulcer, or else you have the same condition of things as before. Now, how shall we do this and prevent our patients losing too much blood? My idea is to excavate the whole mass, make an incision in the connective tissue, so as to cut the skin with its substratum of fat. Go down where there are vessels capable of bringing a certain amount of pabulum to unite the parts, and take the handle of the scalpel and dissect the connective tissue off enough to close over that territory, being careful to arrest the capillary action, and give time for coagulation to take place, and have union by first intention.

Now, what is the line of demarkation between necrosis and what I have been teaching? Ulceration is necrosis; it is necrosis of the

corpuscles in the flesh. Caries is simply superficial necrosis where the alternation of generation in a tissue is suspended, whether in hard or soft bodies. It is the soft-solids in the bony tissues which operate all function.

DR. TAFT: Do you apply necrosis to soft tissues?

DR. ATKINSON: Yes, I do.

DR. TAFT: The remarks of Dr. Atkinson are instructive. There are some points in them of practical bearing, where they come into every day operation; for instance, in the treatment of disease of the gums, where there is this engorgement and disease so often found, containing deposits upon the necks of the teeth. Upon the anterior part of them there is frequently a calcareous deposit. Now the point I wish to reach is this: by the removal of the deposits, that which has induced or kept up this condition, it is generally remedied, but sometimes it is not possible, by such treatment or by the application of medicaments to the gums, to remove it. In such cases, sometimes in connection with these two, sometimes only with the former, a simple rubbing or pressure upon the gums, kept up for some time, will bring them to a healthy condition, by pressing out from the gums these dead corpuscles that remain in these distended capillaries, and allowing the vessels to be filled with fresh blood.

Dr. Atkinson speaks of putting diluted chloride of zinc in the incision he would make outside of this vascular enlargement point around the ulcer. What is the object? It is simply, as I conceive, that the chloride shall arrest decomposition, and so the production of poisonous gases and offensive material. I have experimented some in the same direction with salicylic acid, and I think it will accomplish the purpose better than chloride of zinc, and I would substitute that solution for chloride of zinc.

As you know, Dr. Riggs, of Hartford, Conn., makes a specialty of this thing, and he relies upon the removal of salivary calcareous deposits upon the roots of teeth for effecting a cure of disease of the gums produced in this way. He not only removes the deposits upon the roots of the teeth, but passes his instrument around upon the inner surface of the detached gum, and destroys these distended vessels, removing the poisoned blood, *debris*, etc., and permitting a restoration of healthy circulation. The blood corpuscles, freighted with their nutritive elements, come into the part, and they not only

supply nourishment to it, but they tone up the vessels, and bring them back to their normal condition. In order to a more thorough removal, Dr. Atkinson used to apply aromatic sulphuric acid. That secures a more complete removal of this material, and also acts as a stimulus on the soft tissue.

THERAPEUTICS.

Dr. Atkinson: On the spur of the moment it is difficult to produce anything worthy of the name of a report upon a subject of such importance to us, as a body of men set to rectify untoward functional action in the oral cavity. To the long list of remedies familiar to our literature, we have had one important addition within the year. I refer to the active principle of the phenic or carbol series, viz: salicylic acid. My own experience in its use contradicts the record of all who have written upon the subject, so far as I have read. They all agree in the assertion of its non-corrosiveness when applied to living tissue, and all agree that it is an excellent antiseptic, with which I cordially concur.

It is nearly inodorous, and also nearly insipid, but it is a beautiful light escharotic, when properly applied, in substance or solution, in ether, alcohol or glycerine. It is slightly soluble in pure water, at a normal temperature, more so in boiling water; but when cooled it precipitates largely, although retaining a larger proportion when dissolved in hot than cold water. I dissolve to saturation in alcohol, and use this in full strength for dressing ulcers, and wiping out cavities before filling. Pour this alcoholic solution into water to make a disinfecting mouth wash and deodorizer of spittoons, etc., etc. In fact, it now supersedes creosote and carbolic acid in most cases in my daily practice. As a means of staunching capillary hemorrhage, it bids fair to succeed without destroying the epithelium as do the stronger agents used for this purpose. As an ingredient in dentrifices, I would expect it to excel in arresting and preventing the formation of noxious gases, without offending the senses.

There is oftentimes a disposition of fault-finding among men when criticising the efforts of the seeker after the best agent for the production of certain desired actions upon the organism, and some-

times when we have run through a series of experiments, being for the time enamored of each successive article we use, we may fall back upon that which had been discarded, as being superior to any of those we had preferred during the glamour of our first love. I am a free-lover of that kind. I only admire the agents that do the work the most advantageously, easily and effectively. Yet I confess I do not know but I was the first to use creosote in dentistry. I have never seen a bad result from its use in the hands of a person who understood its application. I would much sooner suspect the manipulative skill and acquaintance of the person with the affinities of this agent for the albuminoid tissues, then suspect the merits of the thing itself. I know it is a deadly poison when taken into the stomach, but that is not the purpose for which the dentist uses it. When diluted to a high degree it acts almost as quickly as electricity. My first acquaintance with it was as an agent to cure dyspepsia. Beginning with four drops to the ounce of water (I have used as high as sixteen) I found it admirable in some forms of dyspepsia.

I am now using salicylic acid for the same purpose for which I used creosote in the mouth. I apprehend, if we understood its application, it would be equally medicinal in its systemic effects. So far as its use in the mouth is concerned, there are different views relative to its action, but all, I think, agree with me that it does not act as an escharotic, coagulating the albuminous substances in the mouth so as to form an eschar. It is beautiful in its application to ulcerous walls or gums that are just on the point of exuding in pus. It has such an affinity for the elements of the flesh that it combines, and is as self-limiting as its parent, creosote, is, so far as its combinatory action is concerned. Any failure to effect a good result by its use must be set down to want of skill and knowledge. Something has been said as to the difference of action between the perfectly colorless article and that which is slightly tinged. As to the difference in color, I do not know the cause, and as to any difference in effects, I have never been able to detect any. In salicylic acid we have very nearly chased the active principle of creosote into a corner.

Dr. Taft: I have used this agent (salicylic acid) some, for perhaps, four months past, and with decidedly good results. My brother

and son have also been using it during the same time, and it has been an almost continuous course of experiment. We have used it as a preventive of inflammation, and in cases where it seemed very difficult to remove a chronic inflammatory condition. I will give a case simply as illustration. My brother had a superior central incisor which became devitalized some ten years ago. It troubled him afterwards, more or less, with soreness about the roots, and at length the root canal was opened through the palatine surface, the *debris* removed, and the tooth treated with carbolic acid and creosote for some time, without, however, removing the soreness. Finally it was filled up with a pellet of cotton moistened with creosote, placed in the canal as near the end of the root as possible, and covered with gutta percha. It remained in this condition until about three months ago, when, my son having been making some experiments with salicylic acid, he proposed to remove these materials and try it in this case. He found the odor of creosote entirely gone, and the canal very offensive. The patient remarked that there never had been a day during these eight years when there was not a sense of soreness upon tapping it, and a great deal of the time it was painful when he would bite upon it. The canal was accordingly cleaned out, and the salicylic acid introduced, the remainder of the canal being filled with os artificel. The soreness was almost immediately removed, and he has not been troubled with it since.

I usually apply it in the form of a saturated solution in sulphuric ether. That dissolves more than anything else I can find. We have used it for abscesses with a similar good result—in abscesses discharging through the gums. In every such instance its use has been attended by very beneficial results.

I apprehend that its great value lies in its disinfectant and antiseptic properties, in its preventing the decomposition of materials that prove so exceedingly offensive when decomposed, and its tendency to form combinations with such materials when decomposed, so as to make them inoffensive.

These are the things chiefly which it accomplishes. I have not thought it very highly escharotic in its character. Certainly it is not so to the extent of creosote or carbolic acid. The whitening which is spoken of when it is brought into contact with albuminous substances I have not observed, nor can I state how far it tends

to stimulate vital activity in a part to which it is applied. It is, at all events, an agent well worth our attention, and one which should be thoroughly tested.

We get this agent, as you know, in the form of clear, white crystals, and also in those of a yellowish cast. I asked a chemist upon what this difference depended, and was informed that it was simply because the yellowish kind had not been refined to the extent that the white had, but that it was just as good for practical purposes as the more refined.

As to the "dental pain obtunder," I will state that I have used it for eight or nine months, in many instances upon sensitive dentine. Not always, to be sure, with perfect success, but generally with very desirable results. I have used it considerably when excavating, and have been enabled, through its use, to operate upon the most sensitive dentine. The active principle in it is from horse-radish.

At the meeting of the Ohio State Society a gentleman had an inferior wisdom tooth filled which was largely decayed upon the buccal surface, and exceedingly sensitive. In attempting to clean the tooth out the most extreme pain was caused, and I was compelled to resort to the remedy under discussion. I put in some of the preparation before putting on the dam, which allayed the pain some, and after putting on the dam, made another application, when the patient became perfectly quiet.

In regard to carvacrol, I do occasionally use it, but I have failed to get such good results in the treatment of abscesses and dead teeth as some of my professional brethern profess to have got.

Dr. W. H. Allen: I have used the "dental pain obtunder" without any good results; it makes me positively sick, and I want none of it.

Dr. Stockton: My patients complain of the smell of it. I have found no benefit from it whatever. I have used salicylic acid successfully. I think a great deal of the trouble with dead teeth depends upon cleansing them too thoroughly at once, a thing I do not attempt to do.

Dr. Osmond: I have used a preparation called "king of pain," for sensitive dentine, which, I have been informed, is oil of mustard. I have found oil of peppermint the most useful of any application for sensitive teeth.

Dr. Flagg: I have tried all the various oils, and oil of peppermint is the worst I know anything about; it will make patients fairly howl. My experience with the "dental pain obtunder" is half-way between that of Drs. Taft and Allen. It does not seem to do much good, and occasionally is exceedingly painful. I have observed that a remedy will sometimes do great things for one person, and nothing for another. I have found "Pond's Extract" a very valuable application for inflammation, and have known of its being used with great advantage in wounds, such as gunshot wounds, etc. I am obliged to use all kinds of remedies, allopathic and homeopathic, and even this, which is a quack remedy.

Dr. Shepard: Temperament makes a great difference with the use of pain obtunders. The nervous effect is often a great deal. If you tell a patient that you are going to use some wonderful thing, and use only water, it will frequently have a great effect. In Boston we do not have such very sensitive dentine; we have only a few patients, mostly young persons, with whom it is necessary to use any obtunder. The miasmatic influences of certain localities render dental troubles more obstinate, and aggravate inflammation. I have found benefit from the "dental pain obtunder" in some instances.

Dr. Abbott: I am not at all pleased with the "pain obtunder." It often produces intense pain. In one mouth it seemed to be productive of some good, and the same day in the same mouth it did no good. It smells badly. I hope, as the result of some experiments now in progress, to be able to produce something that will do the work without pain.

Dr. Morrison: A knowledge of how to excavate, not taking too large chips, and with keen instruments, will succeed best. I have used thymol and other agents, but think there is nothing superior to good old-fashioned creosote.

Dr. I. Knapp (Ft. Wayne): Some agent that would control sensitive dentine would be a boon to those operating in miasmatic regions. The "dental pain obtunder," I think, causes no more pain than any other cold substance. In my region the teeth that are not sensitive are the exception. I have found lime-water, used for three or four weeks, very beneficial. I am sometimes compelled to resort to blue pill, quinine and iron before I can operate without dan-

ger of devitalizing the pulp, and often I cannot treat exposed pulps without doing so. Specific poison must be eradicated before the teeth can be operated upon successfully.

Dr. Butler: It is possible that electrical conditions may have something to do with this matter, and possibly the condition of the operator. The "pain obtunder" has a sickening odor, but in many cases I have found great benefit from it; I think the pain caused by it is due to the coolness produced.

Dr. C. S. Smith: I have observed something like constitutional effects from this agent; it seems to stupefy the whole system. It is my opinion that it is a powerful drug, and should be used with caution. I have heard it suggested that it contains hasheesh.

Dr. Harlan: It is composed of oil of mustard, camphor, aconite and ether.

1876.

TRANSACTIONS

OF

The American Dental Association

AT ITS

SIXTEENTH ANNUAL SESSION,

HELD AT PHILADELPHIA,

August 1st, 2d, 3d and 4th, 1876.

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C. STODDARD SMITH. A. L. NORTHROP. L. D. SHEPARD.

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CONTENTS.

MINUTES OF THE SECRETARY. PAGE.

Roll Call 9
Resolutions of Invitation 13
Report of Committee on Credentials 13
Resolutions on the Death of Dr. Wildman 14, 16
Section on Pathology—Resolution 14, 20
American Dental Society of Europe—Telegram 15
Dr. Jas. Leslie—Resolution 16
Report of Treasurer 17
Selection of Place of Next Meeting 18
Election of Officers 18
Resolutions to Pay Orders on Treasury, etc 19
Standing Committees 19
Resolution on Length of Papers 20
Resolution Relative to Salaries 20
Report of Publication Committee 20
Back Volumes of Transactions—Resolution 21
Special Committee of Arrangements 22
Publication Committee 22
Resolutions of Thanks, etc 22

REPORTS OF COMMITTEES AND VOLUNTEER ESSAYS.

Volunteer Essay on the Health of the Dentist—A. H. Brockway 25
Report on same—John Allen 28
Volunteer Paper on Pathology and Surgery—W. N. Morrison 51
Report on same—J. Foster Flagg 53
Report on Operative Dentistry—Frank Abbott 63
Supplemental Report on same—A. W. Harlan 71
Replanting and Transplanting Teeth—W. N. Morrison 77
Report on Dental Chemistry—S. B. Palmer 101
Sleep vs. Anæsthesia—J. S. Cassidy 107

Volunteer Essay on Solution—J. Taft.....111
Report on Dental Therapeutics—C. A. Bracket.....123
Supplemental Report on same—W. H. Atkinson.....126
Report on Mechanical Dentistry—W. N. Morrison.....141
Supplemental Report on same—W. C. Barrett.....142
Report on Etiology—D. C. Hawxhurst.....147
Supplemental Report on same—M. H. Webb.....152
Supplemental Report on same—H. L. Sage.....157
Report on Dental Literature—M. S. Dean.....177
Volunteer Paper on same—W. H. Dwinelle.....193
Report on Dental Education—W. H. Morgan.....201
Volunteer Paper on same—E. Wilson.....204
Report of Committee on Appliances—G. L. Field.....210
Report on the Status of Dentistry—C. N. Peirce.....217

DISCUSSIONS.

Health of the Dentist.

Discussed by Dr. Kingsbury.....33, 37
Dr. Barker.....34, 36, 37
Dr. Flagg.....35
Dr. Wetherbee.....36
Dr. Morgan.....37
Dr. Rehwinkel.....38
Dr. Stillwagen.....39
Dr. Thomas.....40
Dr. McDonnell.....41
Dr. Stockton.....41
Dr. D. D. Smith.....42
Dr. Atkinson.....43
Dr. McQuillen.....44

Dental Pathology.

Discussed by Dr. Shepard.....45
Dr. Peirce.....45
Dr. McQuillen.....46, 50
Dr. Atkinson.....46, 47
Dr. Francis.....47
Dr. Morgan.....47
Dr. Abbott.....48
Dr. Kingsbury.....48
Dr. Flagg.....49
Dr. Butler.....50

DENTAL PATHOLOGY AND SURGERY.

Discussed by Dr. Shepard 55
Dr. Barker 55, 59, 61
Dr. Flagg 56, 60
Dr. Jno. Allen 56
Dr. Rehwinkel 57, 61
Dr. I. Knapp 57
Dr. Abbott 57
Dr. Stellwagen 58, 59
Dr. Bogue 59
Dr. Morgan 59
Dr. Harlan 60
Dr. Taft 61

OPERATIVE DENTISTRY.

Discussed by Dr. Jas. Leslie 79, 80
Dr. Wetherbee 80, 81
Dr. Kingsbury 80
Dr. Barker 80, 85, 87
Dr. Shepard 81, 98
Dr. Flagg 82
Dr. Morgan 83
Dr. Stellwagen 83, 88, 89
Dr. Hunt 84
Dr. McDonnell 86
Dr. Brockway 89
Dr. Ambler 89
Dr. Taft 90
Dr. Sturgiss 92
Dr. Field 92
Dr. Morrison 94
Dr. Atkinson 94
Dr. Thomas 95
Dr. Corydon Palmer 96
Dr. Winder 96
Dr. McQuillen 97
Dr. Crouse 97
Dr. Butler 99
Dr. Clowes 99
Dr. Keely 99
Dr. Bogue 100
Dr. John Allen 100

DENTAL CHEMISTRY.

Discussed by Dr. D. D. Smith 115, 116
Dr. Wetherbee 116, 117
Dr. Barker 117
Dr. Mills 117
Dr. Cunningham 117
Dr. Flagg 118
Dr. Webb 120
Dr. S. B. Palmer 121

DENTAL THERAPEUTICS.

Discussed by Dr. Barker 134, 136, 137
Dr. Atkinson 135
Dr. Dixon 137
Dr. J. S. Smith 137
Dr. Dean 138
Dr. Hunt 139
Dr. Kingsbury 140
Dr. Jno. Allen 140

DENTAL ETIOLOGY.

Discussed by Dr. Clowes 173
Dr. Abbott 173
Dr. Hunt 173
Dr. McQuillen 174
Dr. Atkinson 175

MINUTES OF TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION,

SESSION OF 1876.

BY C. STODDARD SMITH, SECRETARY.

METHODIST CHAPEL, BROAD AND ARCH STREETS,
PHILADELPHIA, August 1, 1876.

THE Sixteenth Annual Meeting of the American Dental Association convened at the above time and place, the president, Dr. A. L. NORTHROP, of New York, in the chair.

At the request of the president, the proceedings were opened with prayer, by Dr. MORGAN, of Nashville.

The roll of permanent members was called, and the following delegates and permanent members were reported as having paid their dues, those marked with an * not being present, but forwarding their dues:

*ANDERSON, J. J. ..... Springfield, Massachusetts.
ABBOTT, FRANK. ..... 78 West 12th street, New York.
ALLEN, JOHN. ..... West 34th street, New York.
ATKINSON, W. H. ..... 41 East 9th street, New York.
ALLEN, W. H. ..... 18 West 11th street, New York.
ACHESON, V. B. ..... Youngstown, Ohio
AMBLER, H. L. ..... 114 Euclid avenue, Cleveland, Ohio.
ALLAN, C. F. ..... Newburg, New York,

AMBLER, J. G. ..... 25 West 23d street, New York.
*AUSTIN, J. M. ..... 76 Felix street, St. Joseph, Missouri.

*BAILEY, C. M. ..... 208 Central avenue, Minneapolis, Minnesota.
BROCKWAY, A. H. ..... 13 Greene avenue, Brooklyn, New York.
BIDDLE, C. H. ..... 133 Pacific street, Brooklyn, New York.
BUCKINGHAM, T. L. ..... Philadelphia.
BARKER, G. T. ..... Philadelphia.
BOICE, A. ..... 1,612 Vine street, Philadelphia.
BOGUE, E. A. ..... East 20th street, New York.
BECK, C. S. ..... Wilkesbarre, Pennsylvania.
BROWN, S. B. ..... Fort Wayne, Indiana.
BUTLER, C. R. ..... 114 Euclid avenue, Cleveland, Ohio.
BRONSON, W. A. ..... 8 East 34th street, New York.
BLAND, M. A. ..... Charlotte, North Carolina.
BROWN, G. C. ..... Mount Holly, New Jersey.
*BIRGE, J. J. ..... San Francisco, California.
BOCKINS, S. A. ..... Columbia, Pennsylvania.
BRACKETT, C. A. ..... 113 Thames street, Newport, Rhode Island.

*COLTON, A. ..... Hudson, New York.
COOK, C. D. ..... 133 Pacific street, Brooklyn, New York.
CROUSE, J. N. ..... Michigan avenue, Chicago.
*CUSHING, GEO. H. ..... 174 State street, Chicago.
CLOWES, J. W. ..... 5th avenue, New York.
CHANDLER, T. H. ..... 222 Tremont street, Boston.
CHAIM, M. L. ..... 30 Cooper Institute, New York.
COY, B. F. ..... Baltimore, Maryland.
*CANINE, J. F. ..... Louisville, Kentucky.
CARR, WM. ..... 33 West 47th street, New York.
CRYER, M. H. ..... 1,111 Girard street, Philadelphia.

DEAN, M. S. ..... 174 State street, Chicago.
DUNN, C. E. ..... Louisville, Kentucky.
DIXON, F. M. ..... Philadelphia, Pennsylvania.
*DABOLL, G. C. ..... Buffalo, New York.
DWINELLE, W. H. ..... 27 West 34th street, New York.
DONALDSON, R. B. ..... 413 Pennsylvania avenue, Washington, D. C.
*DUTCH, WM. ..... San Francisco, California.
*DOUGLASS, I. ..... Romeo, Michigan.

ESSIG, CHAS. J. ..... 1,533 Locust st., Philadelphia, Pennsylvania.
EISENBURY, J. L. ..... 235 North 12th st., Philadelphia, Pennsylvania.

FLAGG, J. F. ..... 11th street, Philadelphia, Pennsylvania.
FIELD, GEO. L. ..... Detroit, Michigan.
FOSTER, M. W. ..... 48 Franklin street, Baltimore, Maryland.
FRANCIS, C. E. ..... 33 West 47th street, New York.
FREEMAN, R. R. ..... Nashville, Tennessee.
FIELD, S. M. ..... Baltimore, Maryland.
*FREEMAN, S. A. ..... 416 Main steeet, Buffalo, New York.

FARRAR, J. N. ..... 94 Greene avenue, Brooklyn, New York.
FILLEBROWN, THOS. ..... Portland, Maine.

GODDARD, WM. H. ..... 157 Chestnut street, Louisville, Kentucky.
GORGAS, F. J. S. ..... Baltimore, Maryland.
GAYLORD, E. S. ..... New Haven, Connecticut.
GITHENS, J. H. ..... 436 North 4th street, Philadelphia.
GILMAN, S. M. ..... Beaver Dam, Wisconsin.

HARLAN, A. W. ..... 70 Dearborn street, Chicago.
HILL, J. L. ..... Gettysburg, Pennsylvania.
HUNTER, F. A. ..... 192 7th street, Cincinnati.
HOOPER, J. ..... Owenton, Kentucky.
HUNT, R. F. ..... Washington, District of Columbia.
HOFFMAN, W. H. ..... Charlotte, North Carolina.
HONSINGER, E. ..... 318 Park avenue, Chicago.
HOAG, WM. E. ..... 135 Lexington avenue, New York.
HUEY, ROBT. ..... 330 South 15th st., Philadelphia, Pennsylvania.
HAWXHURST, D. C. ..... Battle Creek, Michigan.
HOLBROOK, A. ..... Milwaukee, Wisconsin.
HOLMES, A. M. ..... Morrisville, New Jersey.
HASSEL, SAML. .....
*HOLMES, E. S. ..... Grand Rapids, Michigan.

JARVIE, WM., Jr. ..... Brooklyn, New York.
JACK, LOUIS. ..... Philadelphia, Pennsylvania.

KLUMP, G. W. ..... Williamsport, Pennsylvania.
KINGSBURY, C. A. ..... Walnut street, Philadelphia, Pennsylvania.
KEELY, GEO. W. ..... Oxford, Ohio.
KNAPP, I. ..... Fort Wayne, Indiana.

LYMAN, A. E. .....
LONG, M. LUKENS. ..... 720 North 6th st., Philadelphia, Pennsylvania.
LITTIG, J. BOND. ..... 9 East 17th street, New York.
LORD, BENJ. ..... 34 West 28th street, New York.
LONGNECKER, H. C. ..... Philadelphia, Pennsylvania.

MCDONNELD, G. B. ..... Conneautsville, Pennsylvania.
MORGAN, W. H. ..... Nashville, Tennessee.
MARRINER, J. FRANK. ..... Ottawa, Illinois.
*MCMANUS, JAS. ..... Hartford, Connecticut.
MCMILLAN, J. T. ..... Paris, Kentucky.
MERRITT, CHARLES. ..... 25 West 23d street, New York.
MCCOWAN, GEO. ..... Ukiah City, California.
MILLS, GEO. A. ..... Baltimore, Maryland.
MORRISON, W. N. ..... St. Louis, Missouri.
MILLER, CHAS. ..... 331 Madison Avenue, New York.
MAGILL, W. E. ..... Erie, Pennsylvania.
MCQUILLEN, J. H. ..... 2,100 Arch street, Philadelphia, Pennsylvania.
MCKELLOPS, H. J. ..... Olive street, St. Louis, Missouri.

MOORES, W. S. ..... Maysville, Kentucky.

NORTHROP, A. L. ..... 44 West 46th street, New York.
NOBLE, H. B. ..... 1,111 Pennsylvania avenue, Washington, D. C.
NEALL, E. H. ..... Philadelphia, Pennsylvania.

ODELL, F. M. ..... 18 West 11th street, New York.

PALMER, S. B. ..... Syracuse, New York.
PEIRCE, C. N. ..... 501 North 7th street, Philadelphia, Penn.
PALMER, CORYDON. ..... New York.
PINNEY, W. ..... Newark, New Jersey.

RAWLS, A. O. ..... Lexington, Kentucky.
REHWINKLE, F. H. ..... Chillicothe, Ohio.
ROBERTS, SPENCER ..... Philadelphia, Pennsylvania.

SHEPARD, L. D. ..... Hotel Boylston, Boston, Massachusetts.
STOCKTON, C. S. ..... Newark, New Jersey.
SMITH, D. D. ..... 1,417 Walnut st., Philadelphia, Pennsylvania.
*SWAIN, E. D. ..... 67 Washington street, Chicago.
SAGE, H. L. ..... Bridgeport, Connecticut.
SMITH, C. STODDARD. ..... Springfield, Illinois.
SMITH, J. H. ..... New Haven, Connecticut.
SMITH, A. WILKES. ..... Richmond, Kentucky.
STELLWAGEN, T. C. ..... Philadelphia, Pennsylvania.
STURGISS, S. M. ..... Quincy, Illinois.
SMITH, H. A. ..... 286 Race street, Cincinnati, Ohio.
SEABURY, F. N. ..... Providence, Rhode Island.
SALMON, IRA A. ..... Boston, Massachusetts.
SMITH, JOHN S. ..... 210 Locust street, Columbia, Pennsylvania.
SWARTLEY, J. S. ..... 749 Michigan avenue, Chicago.
SPELLMAN, B. T. ..... Detroit, Michigan.
*SCRANTON, J. N. ..... Bennington, Vermont.

TAFT, J. ..... 117 West 4th street, Cincinnati, Ohio.
THOMAS, G. R. ..... Detroit, Michigan.
THOMPSON, J. R. ..... Newbury, South Carolina.
THOMPSON, J. S. ..... Abbeville, South Carolina.
TRUEMAN, W. H. ..... Philadelphia, Pennsylvania.

ULRICH, H. G. ..... Baltimore, Maryland.

WOODWARD, J. A. ..... Philadelphia, Pennsylvania.
WINDER, R. B. ..... Baltimore, Maryland.
WATERS, G. F. ..... 8 Beacon street, Boston, Massachusetts.
WELLS, MERRITT. ..... Indianapolis, Indiana.
*WHEELER, C. F. ..... Albany, New York.
WEATHERBEE, I. J. ..... Boston, Massachusetts.
WALLACE, W. T. ..... Kingsville, Ohio.
WHITSLAR, F. S. ..... Youngstown, Ohio.

WEBB, M. H ..... Lancaster, Pennsylvania.
WERT, AMOS ..... Philadelphia, Pennsylvania.
WAID, A. J ..... Newton, Iowa.

The reading of the minutes was then proceeded with, but upon motion, the further reading was dispensed with.

Upon motion the rules were suspended to allow Dr. Shepard to introduce the following resolution :

Resolved, That dentists not resident in the United States who may be present, and whose names may be approved by the executive committee, are hereby invited to seats upon the floor, and to participate in the discussions.

The resolution was carried.

The report of the committee on physiology was called for, but as the chairman was not prepared, a paper upon the subject was read by Dr. Brockway, (a member of the committee,) entitled, "The Health of the Dentist as Affected by Modern Modes of Practice."

The executive committee, under the resolution so providing, introduced Dr. E. Wilson, of Havana, Cuba, and subsequently the following gentlemen : Drs. J. Carlos Gardner, Madrid ; Geo. Cunningham, London ; W. McGrath, Pernambuco ; N. Emmons, Santiago, de Chili ; Wm. Armstrong Vice, England ; T. J. Thomas, Madrid ; W. St. G. Elliott, Yokohama, Japan.

On motion the rules were suspended, to hear the report of the special committee on the health of dentists, appointed last year; and Dr. John Allen, chairman, read the report.

A discussion of these papers then took place, participated in by Drs. Kingsbury, Barker, Flagg, Wetherbee, Rehwinkle, Stellwagen and Thomas.

The committee on credentials made a report, which as amended by various supplemental reports, was finally adopted.

[This report never having been in the possession of the secretary, having been lost or mislaid, is necessarily omitted.—SEC].

The executive committee reported the printed program, recommending that it be changed so as to add an evening session on Wednesday, and the program so amended was adopted.

Drs. Buckingham and McQuillen gave notices of invitations to visit certain objects of interest.

Adjourned.

FIRST DAY—AFTERNOON SESSION.

The Association was called to order at 2:45, by the president. The discussion of papers on Dental physiology was declared in order, and remarks were made by Drs. McDonnell, Stockton, Prof. D. D. Smith, Atkinson and McQuillen.

The report of the committee on physiology was then presented by Dr. McQuillen, and the same was discussed by Drs. Shepard, Peirce, Atkinson, Morgan, Abbott, Kingsbury, Flagg and Butler.

Upon leave, Dr. Buckingham moved the appointment of a committee to take action in regard to the death of Prof. Wildman, and the motion being carried, the chair appointed as such committee, Profs. Buckingham, Taft and Chandler.

After some further remarks by Drs. Butler and McQuillen, the subject of physiology was passed.

The next subject, dental pathology, was called, and Dr. Flagg, chairman of the committee, read a report.

Dr. Hunt moved that the report of the committee on pathology be accepted and adopted, and that that portion of it creating a section on pathology be referred to a special committee of three, with instructions to report at one of the meetings of this session as to the expediency of dividing the Association into sections on all subjects, and if in their opinion expedient, to submit a plan therefor.

Carried, and Drs. Hunt, Atkinson and Morgan appointed as the committee.

On motion, the further consideration of the subject of pathology was suspended.

Dr. Shepard moved that the selection of place of next meeting and election of officers be made the special order for Thursday evening, at 8 p. m. Carried.

Adjourned.

FIRST DAY—EVENING SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of chemistry was called, but no report being ready, it was postponed.

The subject of therapeutics was called, and no reports being offered, it was also postponed.

On motion, the subject of pathology and surgery, which had been postponed, was taken up, and a volunteer paper by Dr. W. N. Morrison, was read by Dr. Shepard.

The subject was then discussed by Drs. Shepard, Barker, Flagg, Jno. Allen, Rehwinkel and I. Knapp.

Dr. Ambler moved that Dr. Hill, of Brooklyn, (not a member) be requested to present certain cases believed to be of interest.

On motion of Dr. Shepard, this motion was indefinitely postponed.

The discussion on pathology was then resumed, and participated in by Drs. Abbott, Stellwagen, Bogue, Morgan, Barker, Harlan, Flagg, Wade, Rehwinkel and McQuillen.

On motion of Dr. Shepard, the regular order of business was suspended for the introduction of a motion, and Dr. Shepard moved a reconsideration of the vote by which the motion requesting Dr. Hill, of Brooklyn, to present certain cases, was indefinitely postponed; pending which motion the meeting adjourned.

SECOND DAY—MORNING SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of pathology and surgery was still under discussion, and after some remarks by Dr. Waid, the subject was passed.

The committee on chemistry was called, and there being no report, the subject was postponed.

The committee on therapeutics was called, and asked for further time. Granted.

The rules were suspended to receive a supplemental report on credentials, which was accepted and adopted.

A congratulatory telegram from the American Dental Society of Europe was received, and upon motion of Dr. Shepard, the president and secretary were authorized to answer the same appropriately at the expense of the association, which was accordingly done.

The subject of operative dentistry was taken up, and Dr. Frank Abbott read a report. Dr. Harlan also read a supplemental report on the same subject.

A volunteer paper on the transplantation of teeth, by Dr. W. N. Morrison, and extracts from one on the same subject by Dr. Taft, were then read.

The subject was discussed by Drs. James Leslie, Kingsbury, Barker,

Wetherbee, Morgan, Stellwagen and Hunt, after which the meeting adjourned.

SECOND DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of operative dentistry being still under consideration, was discussed by Drs. McDonnell, Barker, Stellwagen, Ambler, Taft, Sturgiss, Field, Morrison, Atkinson, Thomas, and Corydon Palmer.

On motion of Dr. Shepard, the rules were suspended for miscellaneous business, and the executive committee offered a resolution which, after stating that Dr. Jas. Leslie, (who was not eligible as a member, not being a practicing dentist,) had been admitted under a misapprehension of the facts, instructed the treasurer to return the dues paid by him, and take his name off the roll. Carried.

The committee to take action on the death of Prof. Wildman presented the following resolutions, which were supported by Dr. Buckingham, and their adoption was moved and seconded:

WHEREAS, In the midst of life we are in death, yet in our profound sorrow we bow in meek submission to the mysterious dispensations of Him who doeth all things well;

WHEREAS, In the sudden and unexpected death of that esteemed and valued member of our profession, Dr. Elias Wildman, we have lost a most valuable member; one by whose untiring labor for the last forty years the profession has been incalculably benefitted; who as an investigator and teacher stood in the very front ranks, and whose discoveries and contributions will endure as long as the profession exists; Therefore be it

Resolved, That we mourn the less of our departed brother, the evidence of whose labor and ability and good works were seen every day. That as his professional career was one of constant labor for our benefit, so his private life was pure and unspotted, exhibiting a rare combination of those virtues which constitute the true man and good citizen. That although the place which has known him shall know him no more, yet his name shall not be lost, for it is imperishably written in his works.

Resolved, That we tender to the family and friends the condolence and sympathy of this Association, and that these resolutions be entered on the minutes and a copy sent to the family.

Resolved, That a memorial page in the published Transactions be appropriated for the record of these resolutions.

T. L. BUCKINGHAM,
J. TAFT, } *Committee.*

Dr. Field, from the committee of arrangements, moved that a session be held on Thursday, p. m. Carried.

A motion to adjourn was made, which Dr. Goddard moved to amend by adding, "until 9 a. m. to-morrow."

The amendment was lost, and upon motion, the meeting adjourned.

SECOND DAY—EVENING SESSION.

The Association met, pursuant to adjournment, at the Philadelphia Dental college, at 8 p. m., the president in the chair.

The subject of operative dentistry was still open, and was discussed by Drs. McQuillen, Cronse, Shepard, Butler, Clowes, Field, Keely, Bogue and John Allen, after which the subject was passed.

The subject of chemistry was then taken up, and Dr. S. B. Palmer, chairman of the committee, read a report, after which the meeting adjourned.

THIRD DAY—MORNING SESSION.

The Association met pursuant to adjournment, the president in the chair.

The order of business was temporarily suspended for miscellaneous business.

The report of the treasurer was read, and upon motion was accepted and adopted, as follows:

Wm. H. Goddard, Treasurer, in account with American Dental Association.

1875.	*Dr.*		1875.	*Cr.*	
August, To balance		$189 75	By paid voucher No. 1		$ 68 65
To dues, 1872	$ 5 00		By paid voucher No. 2		125 00
To dues, 1873	30 00		By paid voucher No. 3		50 00
To dues, 1874	60 00		By paid voucher No. 4		50 00
To dues, 1875	555 00		By paid voucher No. 5		350 00
		$650 00	By paid voucher No. 6		21 00
		$839 75	Total expended		$664 75
			Balance		175 00
					$839 75

Philadelphia, August 1 1876. W. H. GODDARD, *Treasurer.*

We have examined the report of the treasurer and found it correct.

FRANK ABBOTT, M. H. WEBB. } *Committee.*

The subject of chemistry being resumed, a paper by Dr. Cassidy, one of the committee, was read by Dr. Shepard.

A volunter paper on the same subject was also read by Dr. Taft.

The subject being open for discussion was spoken upon by Drs. D. D. Smith, Wetherbee, Barker, Clowes, Mills, Cunningham of England, Flagg, Webb and Palmer.

The subject was then passed, and that of therapeutics was taken up, which was opened by a report written by Dr. Brackett, one of the committee, which was read by Prof. Shepard.

Dr. Atkinson followed with a report, oral and written, upon the same subject.

Dr. Shepard moved that hereafter, during the session, speakers be limited to five minutes at one time, and to two speeches on each subject. Carried.

Adjourned.

THIRD DAY—AFTERNOON SESSION.

The Association met pursuant to adjournment, the president in the chair.

The subject of therapeutics was under discussion, and remarks were made by Drs. Barker, Atkinson, Dixon, Dean, Hunt and Jno. Allen, and the subject was passed.

The committee on mechanical dentistry was called, and opened by a report from Dr. Morrison, chairman, who was followed by Prof. D. D. Smith, who read a report written by Dr. Barrett, another member of the committee, and followed with a verbal report of his own, after which, upon motion, the subject was laid upon the table, and the next one taken up.

The committee on etiology made a report by each of its members, Drs. Hawxhurst, Webb and Sage, who read their reports, after which the meeting adjourned.

THIRD DAY—EVENING SESSION.

The Association met pursuant to adjournment, the special order being selection of place of next meeting and election of officers.

The selection of place of next meeting was declared in order. On motion it was voted that the selection be made by ballot, and that after the first ballot, all except the three highest be dropped.

It was moved and seconded that no member speak more than once, nor over two minutes upon nominations. Carried.

The ballot was then proceeded with, and upon the fourth ballot Chicago was selected.

The election of officers was then proceeded with, with the following result:

President—Geo. W. Keely, Oxford, Ohio.
First Vice President—C. N. Peirce, Philadelphia.
Second Vice President—Corydon Palmer, New York.
Corresponding Secretary—J. H. McQuillen, Philadelphia.
Recording Secretary—C. Stoddard Smith, Springfield, Ill.
Treasurer—Wm. H. Goddard, Louisville, Ky.
Executive Committee—(New Members)—G. H. Cushing, J. N. Crouse, A. L. Northrop.

On motion, the meeting adjourned.

FOURTH DAY—MORNING SESSION.

The Association met pursuant to adjournment, the president in the chair.

After the reading of the minutes, the subject of etiology was declared open for discussion, and remarks were made by Drs. Hawxhurst, Clowes, Abbott, Hunt, McQuillen and Atkinson, after which the subject was passed.

The committee on dental literature was called, and Dr. M. S. Dean, chairman, proceeded to read a report, when it was moved that the reading be suspended on account of want of time, and that the paper be referred to the publication committee. Carried.

A volunteer paper upon the same subject was then read by Dr. W. H. Dwinelle.

The rules were suspended for the purpose of attending to miscellaneous business.

The following resolutions, offered by the executive committee, were adopted:

Resolved, That the treasurer be authorized to pay the drafts of the publication committee, as required.

Resolved, That the treasurer pay the bills of the committee of arrangements, janitor, and salaried officers.

Resolved, That the treasurer notify all permanent members of their arrearages, and the necessity of paying the same.

The committee on nominations made their report of committees for the ensuing year, which on motion was accepted and adopted.

	PHYSIOLOGY.	
M. S. Dean,	R. B. Winder,	J. N. Farrar.
	PATHOLOGY AND SURGERY.	
I. Knapp,	J. Taft,	F. H. Rehwinkle.
	HISTOLOGY AND MICROSCOPY.	
C. N. Peirce,	E. D. Swain,	H. C. Longnecker.
	CHEMISTRY.	
S. B. Palmer,	J. S. Cassidy,	C. J. Essig.
	THERAPEUTICS.	
C. A. Brackett,	C. R. Butler,	F. M. Odell.
	OPERATIVE DENTISTRY.	
G. H. Cushing,	A. W. Harlan,	F. J. S. Gorgas.
	MECHANICAL DENTISTRY.	
W. N. Morrison,	F. A. Hunter,	M. W. Foster.

ETIOLOGY.

D. C. Hawxhurst,	M. H. Webb,	H. L. Sage.

LITERATURE.

W. A. Bronson,	A. L. Northrop.	E. A. Bogue.

EDUCATION.

L. Jack,	J. N. Crouse,	Thos. Fillebrown.

PRIZE ESSAYS.

W. H. Morgan,	B. Lord,	L. D. Shepard.

The special committee on sections made a report, through its chairman, which was received and adopted, as follows:

The special committee having in charge the subject of dividing the Association into permanent sections, which shall be analogues of the present standing committees, beg leave to report progress, and respectfully submit the following statement and recommendation:

That the committee, after consultation, are unanimously in favor of the contemplated measure, but have not time at the present session to prepare such a report as the importance of the subject demands. They therefore recommend that the Association permit them to continue their labors, and report fully at the next annual meeting.

R. FINLEY HUNT,
W. H. ATKINSON, } *Committee.*
W. H. MORGAN,

The executive committee offered the following, which was adopted:

Resolved, That it is the sense of this association that all papers which will require more than fifteen minutes to read, shall be reduced by the writers to a synopsis which shall not occupy more than 20 minutes in the reading, the paper as a whole being referred to the publication committee.

The following resolution was adopted:

The executive committee would recommend that the salaries of the treasurer and secretary be raised to $100 per year.

The publication committee read its report, which, on motion, was accepted and adopted.

The publication committee have to report that they have had published 350 copies of the Transactions of 1875, in a style of print, paper and binding identical with those of the previous year, in order that the two volumes may be bound in one by members, in any style they may choose. They have been distributed by the committee in the usual manner, and at the opening of this session, about 200 copies remained on hand.

The amount expended by the committee, as per bills and vouchers, for printing and distributing the transactions and other printed matter, is as follows:

Credit.

Printing Transactions	$248 00	
Printing Illustrations for same	110 75	$358 75
Wrappers and Circulars		3 00

Postage, Stationery and Express charges	41 14
	$402 89
Printing 1,000 copies Constitution	20 00
	$422 89

Debit.

To Balance on hand from last year	$ 20 95	
To Cash from Treasurer	350 00	
To Cash from Books sold	11 30	
		$382 25
Balance due the Committee		40 64
		$422 89

Your committee desire to call attention to the fact that the Transactions of this association fail for some reason to reach and consequently to benefit the profession at large. This body expends considerable money year by year in placing in permanent form the results of its deliberations; yet from year to year there remain in the hands of its officers a large number of volumes which are not sold, and which have heretofore been disposed of for the postage. It seems to be a matter of regret that this is the case. It would seem to be the province of this body, if its Transactions are of any value, to place them before the profession; and yet it may be considered injustice to the members who have paid their dues, to allow others to become possessed of these volumes without assisting in defraying the expenses of the publication; yet when published, it would appear to your committee better that they should be offered for sale by advertisement or otherwise, at even a nominal price, so that they might be rendered useful, rather than remain as so much waste paper. As to the best method of doing this, your committee are not clear, but we suggest it for your consideration. C. STODDARD SMITH, *Chairman.*

On motion of Dr. Barker, the secretary was instructed to expunge from the minutes the objection to the resolution relative to the memorial page in memory of Dr. Wildman.

It was moved and seconded that when this session adjourns, it be to meet at the call of the president on the boat this afternoon. Carried.

Dr. Taft moved that back volumes of the transactions may be furnished to libraries of colleges on payment of postage. Carried.

On motion of Dr. Bogue, the vote by which the reading of Dr. Dean's paper was suspended, was reconsidered.

The report of the committee on the status of dentistry, was, at the request of the chairman, referred to the publication committee.

Dr. Thomas moved that the publication committee be instructed to advertise back volumes of transactions at the nominal price of $1.00.

A motion to refer the report of the committee on appliances to the publication committee, was lost.

The regular order was returned to, and the reading of Dr. Dean's report was concluded.

The subject of dental education was then taken up, and the chairman, Dr. Morgan, read a report.

Dr. Crouse, another member of the committee, asked to be excused at this session, and no objection being heard, it was laid over till the next session.

Dr. Keely spoke to a question of privilege, and of personal explanation.

Dr. Buckingham moved to lay the whole matter on the table. Carried.

On motion of Dr. Crouse the newly elected officers were installed, and the new president, Dr. Keely, took his seat.

The president appointed as the special committee of arrangements for the next session, Drs. Dean, Harlan and Honsinger, of Chicago; and as members of the publication committee, Drs. A. L. Northrop and L. D. Shepard.

On motion, the chairman of the committee on appliances was allowed to read his report on the boat.

The minutes of the morning session were read, and on motion the meeting adjourned, to meet on the boat this afternoon.

FOURTH DAY—EVENING SESSION.

The Association met at 8 o'clock, in the cabin of the steamer John A. Warner, on the Delaware river.

The report of the committee on instruments and appliances was called for, but the time being insufficient and the circumstances not being favorable for its consideration, it was moved and seconded that the report be referred to the publication committee. Carried.

A volunteer paper, by Dr. E. Wilson, of Cuba, on dental education, was also, for like reasons, similarly referred.

Dr. Hunt moved a resolution of thanks to the profession of Philadelphia, for their courtesy and kindness. Carried.

It was moved and seconded that the thanks of the Association be tendered to the Academy of Natural Sciences and the University of Pennsylvania, for courtesies received; also to the trustees of the church in which the meetings were held, for the use of the edifice. All of which were carried.

Dr. Bogue moved a reconsideration of the vote by which the next place of meeting was fixed at Chicago. That motion was laid on the table.

A motion to adjourn was made and carried, and the Association was accordingly declared adjourned, to meet in Chicago on the first Tuesday in August, 1877.

C. STODDARD SMITH, *Secretary.*

In Memoriam.

WHEREAS, In the midst of life we are in death, yet in our profound sorrow we bow in meek submission to the mysterious dispensations of Him who doeth all things well;

WHEREAS, In the sudden and unexpected death of that esteemed and valued member of our profession, Dr. Elias Wildman, we have lost a most valuable member; one by whose untiring labor for the last forty years the profession has been incalculably benefitted; who as an investigator and teacher stood in the very front ranks, and whose discoveries and contributions will endure as long as the profession exists; Therefore be it

Resolved, That we mourn the loss of our departed brother, the evidence of whose labor and ability and good works were seen every day. That as his professional career was one of constant labor for our benefit, so his private life was pure and unspotted, exhibiting a rare combination of those virtues which constitute the true man and good citizen. That although the place which has known him shall know him no more, yet his name shall not be lost, for it is imperishably written in his works.

Resolved, That we tender to the family and friends the condolence and sympathy of this Association, and that these resolutions be entered on the minutes and a copy sent to the family.

Resolved, That a memorial page in the published Transactions be appropriated for the record of these resolutions.

The Health of the Dentist,

AS AFFECTED BY

MODERN MODES OF PRACTICE.

BY ALBERT H. BROCKWAY.

A very general and probably well founded impression prevails among the members of our profession, that the occupation in which they are engaged is one, which more than most others, taxes the physical energies, and lowers the standard of health of its followers. In a paper which was read before this body at its meeting a year ago, and in the lengthy discussion which followed it, this view was taken with scarcely a dissenting voice, and, so important did the subject seem, that a committee was appointed to investigate the matter, inquire into the causes, and, if possible, to suggest the means for better conserving the health of the dentists.

The melancholy, not to say alarming, statistics with which the paper was fortified, might well

"damp with omen of our own decease"

the most hopeful and vigorous among us, were we not sustained and quieted by that feeling within, which makes

"All men think all men mortal but themselves."

Nevertheless, since we cannot, if we would, divest ourselves of a certain degree of apprehension for our *friends*, the subject must necessarily possess for us a more than passing interest.

Not purposing in any sense to encroach upon the province of the committee, I desire, in a very brief manner, and without by any means exhausting the theme, to direct attention to what would seem to promise a more hopeful outlook for the dentist of the future than has been enjoyed by his prede-

cessor; I refer to the probable influence of the modern modes of practice upon the general health of the practitioner.

It will not be questioned that there has been within the past decade a marked change in the methods of practice, and taking the latter half of that period, the change has been scarcely less marked in the *ideas* which guide and govern us therein, than in the means and instruments employed.

To speak of the change in ideas, no one can have failed to observe (and some have observed it with unconcealed regret) the prominence which has been given in our discussions and publications, to the subject of amalgam, and that, from being the black, proscribed, and hated thing it formerly was, whose use, even though occasional, and in the most extreme cases, must be admitted with "bated breath," it now comes boldly back into the ranks, emancipated and disenthralled by the genius of scientific and unprejudiced investigation, and takes its rightful place as a valuable, and at present, indispensable adjunct in the salvation of a large class of teeth.

When it is considered that this material is now very generally used among respectable practitioners in that class of cases the management of which formerly, most taxed the endurance and vitality of the dentist, namely, those pulpless and more or less broken-down teeth, requiring a considerable amount of restoration, often involving, in the use of gold, several hours of most laborious and exhausting effort, it will, I think, be apparent that the change in this respect has been for the benefit of the operator, at least, in a physical point of view.

Not so marked as the example just noted, but still in the same direction, is the more general use of non-cohesive gold, and the combination of gold and tin which now obtains. Leaving out of the question the merits of these forms and combinations of material, as compared with strictly cohesive gold, which was but a few years since almost exclusively used, it will be seen that in this also the comfort and convenience of the operator is promoted, inasmuch as their use involves far less time than does cohesive gold.

Still further in the same direction is the influence exerted by more enlightened and intelligent ideas upon the subject of the treatment of nerve cases, the management of cases of irregularity, the preliminary wedging of teeth, etc., all of which are now undertaken and accomplished in notably less time and with more ease than formerly, and consequently lighten in like degree, the burden of the practitioner.

More important than all else, yet mentioned as conducing to the relief of the operator, is the employment of an assistant at the chair; a practice which, though by no means so general as it should be, is yet becoming more so year by year, and the value and advantage of which can scarcely be overestimated. Fortunate indeed is the man who has the co-operation of an intelligent, faithful assistant, an *alter ego*, watchful of his needs, ready and quick to supply them, saving a hundred little steps and movements, as well as

relieving him of the more fatiguing duties of running the engine or malleting his fillings.

Turning now from this brief and imperfect consideration of some of the ideas which have tended to modify our practice, let us consider the probable effect of the introduction of some recent instruments and appliances: the mallet, the rubber dam, and the burring engine. I name them in the order of their introduction, which is perhaps in the inverse order of their importance. Leaving out of question in this view of the matter, all consideration of the interests of the patient, which it would be easy to show, were subserved not less than those of the operator, I hold that the employment of these three adjuncts, is doing a vast and incomputable amount of good to the profession at large, in the matter of their physical well-being, not only in relieving the severe and often protracted muscular effort, as is the case with the mallet and engine, but also as in the case of the rubber-dam, sparing the mental anxiety frequently attendant upon the operations of filling with the use of napkins, in the "good old way," an anxiety, which, to a conscientious and painstaking operator, is often far more exhaustive than the accompanying physical exertion.

Since it is admitted that much of the ill-health complained of is the result of the confinement within doors, almost of necessity imposed upon the dentist engaged in such a practice as will comfortably support his family, it will not be difficult to show that these means, the mallet, the engine and the dam, are destined to work powerfully in his favor by not only lessening his labors, but abbreviating them as well, thus leaving him in a better condition to enjoy that out of door exercise and recreation, so necessary to his well-being, which their employment allows him to take.

REPORT OF THE COMMITTEE

ON THE

HEALTH OF THE DENTIST,

BY

J. ALLEN, CHAIRMAN.

Your committee, to whom was referred the subject of the "Health of the Dentist," beg leave to submit the following report:

From a careful investigation of this subject, we find that the peculiar nature of a heavy dental practice tends to overtax the system of the dentist, more severely than that of other professions or callings.

The reasons assigned for this by many of our members (eminent in their profession) are, that it is evidently due, not only to his close confinement but more especially to the numerous intricate and prolonged operations which he is often required to perform under trying circumstances, and also to a consequent neglect to observe and obey certain well established physical and mental laws to which man is amenable.

These laws are found to be universal, and for wise purposes irrevocable. No class, profession or calling is exempt or out of their jurisdiction. They have their rewards and punishments. If carefully observed and obeyed, they bring their recompense; if disregarded—their penalties, whether from ignorance or neglect.

Now, in our profession, we think there are those who neglect the observance of these laws, more from a careless indifference, perhaps, than from a want of knowledge upon this subject, for as professional men we are supposed to understand them, but if we fail to recognize and observe them, a plea of ignorance or neglect will not change or avert the consequences, for in our physical, as in our civil laws, all are presumed to know them, and their violation incurs corresponding penalties.

Therefore, in our profession, it seems the more important that these laws should be thoroughly understood, and faithfully obeyed, for as we cannot change the nature of our calling, we should endeavor to so modify our habits and system of practice as to accord as nearly as possible with the laws of health, for as before stated the nature of a heavy dental practice is such that it tends to overtax the system of the dentist more severely than that of other callings.

By way of illustration, let us look for a moment at the medical practitioner. He visits his patient, which affords him a walk or ride, either of which promotes health, and when at his place of destination, he proceeds to diagnose his case, writes his prescription, gives directions for the care of his patient, all of which occupies some fifteen or twenty minutes, and then is off again upon another mission of a similar nature, and thus passes the day with him. In the meantime the dentist is confined to his room, perhaps performing some difficult operation in the mouth of a nervous irritable patient, which exhausts his vital force at a rapid rate.

At length the patient is dismissed, and another, who has been waiting, takes the chair, and his duties are again repeated, without any intermission for a walk or ride, as his neighbor the doctor has. And thus passes the day with the dentist. And as with these two men to-day, so is it repeated to-morrow, next day and next week, and as with days and weeks, so with months and years.

The one has plenty of fresh air and out door exercise, while the other is denied both, and thus the equipoise of the mind and body of the *one* is maintained, while in the other case there is an undue expenditure of vital force, from prolonged tension upon the brain and nervous system.

Many other like examples might be given, but we prefer that each one should draw his own parallels.

Now, you will observe that in the case above named, the dentist has failed to obey the requirements of at least two important laws of health. First, he has permitted his brain and nervous system to be overtaxed by means of prolonged operations; and secondly, he has denied himself a sufficient amount of exercise in the open air to throw off the waste or spent particles of his body, to give place for fresh supplies for the system.

The penalties for these transgressions, when oft repeated, are head-aches, indigestion, constipation, irregular appetite, a blurring of consciousness, and disintegration of ideas. These, together with gloomy presentiments and dark misgivings, are pathognomonic conditions of cerebral anæmia, and if long continued, are liable to result in dementia or insanity, especially when prolonged tension upon the brain is of a chafing or irritating nature, as often occurs in dental practice, for, as Dr. Brichton Brown, of the Wakefield

Asylum, says: "Let me press this truth upon you, that it is not pure brain work, but brain excitement or brain distress that eventuates in brain degeneration and disease.

Calm, vigorous, mental labor may be pursued without risk or detriment, but whenever an element of feverish anxiety, wearing responsibility, or vexing chagrin, is introduced, then come danger and damage.

Here we have the two forms of mental toil well contrasted, which clearly illustrates the effects of mental worry upon the brain, and also how physical conditions may conduce to the development and aggravation of mental distress."

Again, we find others whose dental rooms are small and poorly ventilated, consequently the operators are subjected to the ill effects of an impoverished atmosphere for respiration, especially in cold weather.

They seem to have forgotten that a man breathes eight hundred and thirty-three times every hour, which requires over one and a half hogsheads of pure air, or double that quantity for two persons, himself and patient. This element conveys to the lungs, with their nine millions of air cells, their natural food, and you will recollect that inspired air is life giving, and expired air is life destroying. As a proof of this, experiments have shown, that to put a mouse into a bottle and cork it tight, although the bottle may contain air in bulk ten times greater than that of the mouse, yet in a short time the mouse will die. History furnishes most appalling instances of human beings perishing in a short time from breathing expired air. Probably many of you recollect the circumstances of one hundred and forty-six soldiers being ordered into a small unventilated hole in Calcutta for a single night; in the morning one hundred and twenty-three were dead, and nearly all the survivors died soon after with putrid fever.

In chemistry, you will recollect, there is a law of diffusion, which causes a minute intermingling of gases or odors with the surrounding atmosphere, and a small escape of gas will soon mix itself equally with all the air in a room; so with noxious vapors exhaled from the lungs, though less perceptible, as evinced in crowded halls, even for one hour. Therefore, small and illy-ventilated operating rooms are found to be detrimental to the health of the dentist.

Again, we find other operators with impaired nervous systems, who resort to narcotics and stimulants for relief. There are different kinds of these substances used by man in different parts of the world, all of which are classed under the head of poisons. These are the coca leaf, the betel nut, tobacco, hemp, opium, alcohol and thorn apple. These are all more or less intoxicating in their effects, yet they differ in their nature and degree, but we will only dwell upon such as are used in this country, and upon this

point we invite your special attention. We learn from our anatomical researches that the human body is built up atom by atom, and when fully formed and developed, consists of the head, trunk and limbs. These different parts of the body are formed from some fourteen different nutrient substances, which are contained in the food designed for man. These together with pure air and water are *all* that *nature* requires to build up and sustain the human structure. Therefore narcotics and stimulants are foreign substances, that do not assimilate with human tissue, nor can they (like food) enter into, or form any part of the living organism of man. Yet, under certain abnormal conditions of the system, they may serve a temporary purpose when judiciously administered, but no permanent good can result from the habitual use of them, and with many persons, moderation is so hard to maintain, that these substances should be shunned rather than embraced by over-worked dentists, who may have no reserve force to spare, to eject them from the system. For example, those who have become habituated to the use of opium, either by chewing, smoking, or in a liquid form as laudanum, are ever gradually increasing the quantity, in order to stimulate the benumbed brain and nervous system up to the desired narcotized condition. From the initial dose of thirty or forty drops, De Quincy says he "was seduced into the accursed habit, and at length became an opium drunkard, and the few drops at first, which spread rosy visions before him, soon became an hundred, and the hundred became a thousand, and so continued to increase, until his daily consumption was eight thousand drops."

And so it is with the other fashionable poisons referred to. For instance the experience of the tobacco devotee, whether in chewing or smoking, tallies with that of De Quincy, with his opium. From the small cigarette occasionally, the confirmed smoker at length consumes a dozen or more cigars per day.

And the half gill of spirituous liquor occasionally taken at the beginning, grows upon the habitual dram drinker to a quart or more per day, to say nothing of the physical or mental results that follow in their train, which are too well known to require comment from us at this time. And just here please to note the different results upon the system, between substances that are not nutrient, and those that are.

According to physiological teaching and practical experience, narcotics and stimulants fail to supply the natural wants of the body with proper nutrition, and the system seems to call for more! more! more! which the devotee to their use, interprets to mean more liquor or tobacco, as the case may be, whereas, with the proper quantity of nutrient substances to meet the normal demands of the system, enough is all that is required, and the man of sixty craves no more water to drink, or food to eat, than he did at the age of thirty.

It is the law of waste and supply that is to be complied with on our part, and nothing more is required to sustain a sound body, and a vigorous mind, than the few simple materials here referred to, which are supplied by the Creator in just the right proportions from nature's laboratory, and whenever we depart from the established laws of nature, we transgress the laws of health. But, says the confirmed smoker, my cigar affords me the greatest enjoyment I have; and his demeanor verifies his words. See him in the gay evening assemblage, where music, beauty, wit and talent rule the hour; he longs for the poisonous nicotine, and seeks another room or a walk in the dark, where he can hold sweet communion with tobacco smoke. The higher sensibilities of his nature seem to have become so torpid that the delights of the drawing room sink into insignificance compared with the pleasures of a cigar. Or if he be a devotee to strong stimulants, then he seeks the social glass with others like himself. Now let us fall back to some of the fundamental principles upon which our profession is based, and there we find that these and other like substances are not auxiliaries or addendas to the laws of health. But on the contrary, when used to excess, they lead to the transgression of those laws. An eminent English medical writer upon this subject, says "A stimulant is an agent which enables the system to use up more of its stored force than it could otherwise do, in other words, it enables a person to borrow from himself. The system possesses the power of using up so much of its force, and no more; the rest is held in reserve; a stimulant enables the individual to use up some of the reserve force—to borrow from himself."

Now this loan, however useful at the time, has, sooner or later to be met; and just here note the difference between the use and abuse of spirituous liquors. If they can be used as a convenience for a time only, their injurious effects will not be perceived, for the incomings of vital force from proper nutrition will be sufficient to replace the loan. But if the loan from the body-bank is oft repeated and not repaid or met by the incomings, then there comes a permanent deficit, and physiological bankruptcy is the result.

In conclusion, your committee would recommend to overworkers, that a less number of hours per day be devoted to dental practice, and when operations are of a rasping nature let the hours be shortened, and make it a point to take as much out-door exercise as circumstances will permit. With reference to operating rooms, they should be large and well ventilated.

Narcotics and stimulants should not be habitually used by our members, as they are found to be far more detrimental than beneficial, to both body and mind.

DISCUSSIONS.

Dr. Kingsbury (Philadelphia): I feel very much gratified to think that the health of dentists is considered a matter of so much importance as to call for the appointment of a special committee, and I have been very much gratified and profited by the papers which have been produced upon the subject, especially by that of Dr. Allen. That good, sound health, is a prerequisite to the highest success in the practice of our profession, I suppose no one doubts.

The paper of Dr. Allen touches on some very important points: the necessity of complete and thorough ventilation in the dental office, and the importance of free, out-of-door exercise, to the preservation of a good physiological condition. This is something which has engaged my attention for years. It is a common practice on the part of dentists to confine themselves too rigorously to their offices. The possession of strong muscles, and firm, healthy nerves, is as essential to the success of the dentist, as a knowledge of the principles of his art, and the possession of high mechanical skill. For the past twenty years I have been in the habit of taking a vacation during the warm season, always including the month of August.

No class of men expend a larger amount of nervo-muscular force than dentists, and there is none whose occupation more imperatively demands a period of relaxation.

It is not to be questioned, I think, that we, as a people, are living on too high a plane. Our grade of social life has reached too high a degree of refinement, and our habits are too artificial. For many years I have spent my time in the summer along the lakes and streams of New England, and among its mountains and forests. I am particularly fond of angling, and I have found that to be above all others, a healthful and pleasant recreation.

There is one other point to which I desire to call attention, namely, the use of stimulants. I think that Dr. Allen's remarks upon this subject are most truthful and forcible. It seems evident that there is a growing tendency to the use of stimulants in our country among all classes, even among the gentler sex. Our own profession is by no means an exception. A moment's reflection upon the subject will recall to your minds many eminent and talented members of our profession who have cut short their

usefulness, and gone down to premature graves in consequence of their indulgence in over-stimulation. That stimulants occupy an important place in the medical pharmacopœia there can be no doubt, but it is certain that their abuse constitutes a great evil. It is true that the use of stimulants sometimes produces an artificial brilliancy of mind, and that, under their influence, men have produced very many beautiful things of a literary character, but these very men who have, under the influence of liquor, flamed out in such sudden and brilliant mental vigor, would unquestionably have produced much more valuable results, had they wrought them out in the spirit of sober and honest industry. In our own profession there are many times when the depression and exhaustion of an overtaxed system seems to call for some kind of stimulant, and if indulged in, there is an apparent gain in working vigor; but this is really not so, the reaction is invariably greater than the forward impulse. Abstinence from stimulants invariably conduces to clearness of brain, steadiness of nerve, and a healthful tone of the system.

Dr. Barker (Philadelphia): I must say that I am somewhat disappointed by the position taken by the committee. I agree in the main with the views they have advanced, but they have ignored some physiological facts which are quite worthy of presentation. I must differ with those gentleman who regard dentistry as an exhaustive profession. I do not regard it so, nor in the least calculated to shorten life. I believe there is no single profession better calculated to prolong life, and to develop a higher type of mind than dentistry. It is true that dental appliances and facilities have been so limited and so illy adapted to efficient and easy operating, that in times past dentists have labored to great disadvantage, and in a manner which greatly interfered with the physiological processes and functions of the system. It is necessary, in order to have perfect health, that we have perfect nutrition, and perfect nutrition is not attainable when the system is kept in a constrained position. We must have unconstrained peristaltic action—a free movement of the bowels and diaphragm. In order to the maintainance of a proper position, the chair should be so constructed as to be adjusted and regulated entirely to suit the convenience of the operator, and admit of an erect position while operating.

Many dental operations are calculated to call forth the highest skill, ingenuity and study, on the part of the operator, as well as to call into play the physical forces of the system, and I contend that such operations tend to develop the whole man—mentally and physically.

There is another point which is worthy of notice, viz: the influence which different patients exert over us. We are all of us affected, more or less, in this way. You may call it magnetism, or what you will, but certain

it is that one class of patients exert a bracing and tonic influence over you, while others depress and enervate you.

Another thing which I think tends to produce ill health, especially dyspepsia, among dentists, is the fact that they rush into their work too soon after taking their meals—in the morning too soon after breakfast, and in the afternoon too soon after dinner. This, in connection with the constrained positions which they occupy, tends greatly to disturb the functions of the digestive organs. Experiment has repeatedly shown that, in order to perfect digestion, the other parts of the system must be in a comparatively quiescent state, and the natural flow of blood to the stomach which takes place during the process of digestion, must be allowed to go on without interruption. Too many of us eat heartily, and then, without the slightest interval of repose, resume our work. In this way the blood is diverted from the stomach to the brain and other organs, and we have, as a result, mal-nutrition and indigestion.

I agree with my friend in what he says about tobacco and spirituous liquors, with a modification. I do not desire to be understood as advocating or encouraging the undue use of stimulants; but I do say that these things have their uses. It is only their abuse which is to be deprecated. Nor do I think that the statement that dentists, as a class, are addicted to an undue use of stimulants, is correct. I have had a somewhat extensive acquaintance with the members of the dental profession in this country, and I am convinced from my observations among them that exactly the reverse is true of them as a class. Proprietors of hotels have said to me: "I was mistaken in your body. When we have conventions we always take them at a reduced price, believing that we shall more than make up the difference at the bar; but I was mistaken as to your body. They spend very little at the bar."

The gentleman who preceded me seems to overlook the fact that alcoholic stimulants possess considerable nutritive power. I contend that we have in alcoholic stimulants a medicine which is priceless. Every careful physician knows that when properly used, alcoholic stimulants are of a high medicinal value, particularly in cases of consumption.

Dr. Flagg (Philadelphia): I do not rise to speak upon this subject because I feel any special interest in it, or because I think I shall be able to contribute to the discussion any ideas or suggestions of importance. I do not rise with a view of making any converts to abstinence from stimulants. So far as I practice abstinence, it is not with a view of adding to my longevity, for I long since abandoned that idea; it is not with an idea of escaping from a premature grave, for at my time of life I cannot do that; (I am fifty years old). I was educated as a young man, in the Young Men's school of

the Quaker City. That is a very mild school to outsiders, but those who have graduated there know very well what a familiarity with stimulants is acquired during a course there: I know rum and tobacco; I have smoked my twenty-five cigars a day, and then I have smoked my black pipe, so strong that nobody else could smoke it. For fifteen years, as a practitioner of dentistry, I paid my respects to those two stimulants, rum and tobacco, and now, for fifteen years I have not paid my respects to rum and tobacco, and I merely wish to speak for the purpose of supporting those gentlemen who do not use rum and tobacco, or who have abandoned their use. I do not agree with my friend Barker in regard to the wonderful curative powers of alcohol. I have never seen a case in which it has seemed to me that the administration of an alcoholic stimulant produced one single particle of good, and I have seen many cases where I think they have carried a patient to the grave. Make outside applications of these things if you please, but keep them outside.

I agree with Prof. Barker, that within the last twenty-five years, the practice of dentistry has been wonderfully facilitated. Practitioners of to-day know nothing about how meagre and incomplete was the dental outfit of years ago. Why, the appliances of to-day have made the practice of dentistry almost a pastime! I go to my chair now every morning at half-past eight o'clock, and work until half-past five in the afternoon, and, thanks to the various appliances at my command, I do not feel any the worse for it.

Prof. Barker: I hope I am not understood as advocating the use of rum and tobacco; I only desire to take an enlarged view of the subject, and not a narrow one.

Prof. Wetherbee (Boston): I was a little surprised to find my friend Barker advocating as strongly as he has done, the theory that there is nourishment in alcohol. The best American authorities, as well as the best foreign writers, assert that alcohol does not nourish the human system, and I believe that the conclusion thus arrived at by those eminent writers is a just one, and one which cannot be controverted by arguments drawn from experience or observation.

The ground is so well gone over by the chairman of the committee, that but little more need be said on the subject of the means of promoting the health of dentists. There is one source of recuperation from the effects of a fatiguing dental practice however, which the author of the paper forgot to mention. One of the very best means of keeping up the tone of the system, is the custom of driving or horse-back riding. If inclined to dyspepsia, he had better take to the saddle, and the harder the horse, the sooner will his dyspepsia be cured. I use both the open carriage and the saddle, and

after the labor of the day, I step into my carriage, and drive, sometimes three hours, always managing to forget, before I return, all the fatigues and vexations of the day. If one is not able to keep a horse, a gentle walk in the open air is an excellent thing. Smoking and chewing are to be eschewed, except in very rare cases, where tobacco is a remedy for a certain terrible disease, and the only known remedy. I go in for temperance, and for hard work, and for the use of all those modern improvements, which have come so timely to our aid. I agree with Prof. Barker, that the dental profession is not particularly calculated to impair the health of the operator, but on the contrary, is conducive to health and long life.

Prof. Barker: I must differ with the gentleman in his assertion that alcohol does not possess nutritive properties. I deny that entirely. I could refer him to a score of the best writers, who maintain that it does possess nutritive properties—such writers as Stille, Wood, &c. At the same time, I do not wish to be understood as advocating the indiscriminate use of stimulants.

Dr. Kingsbury: Touching the remarks of Prof. Wetherbee, I presume he has derived benefit, in a hygienic point of view, from the use of the horse and carriage. I have been accustomed to the use of horses for a large part of my life time, and I speak advisedly when I say that I am satisfied that the recreation thus derived is not comparable with what one gets in the mountains, and by the side of the streams. For several years I have had, at a certain point in Northern Vermont, three boats, and also two tents, and during the summer I am accustomed to take my rod and fly, and spend my time exclusively along the streams in the depths of the forest. I have also a little instrument—an aneroid barometer—and in climbing hills and mountains, I take a measurement of their elevation; all this gives additional interest to my pedestrian excursions. This kind of life I consider decidedly the best calculated of any to promote health and vigor. The lungs, we know, are the most important organs of the body, in ridding the system, through the functions of respiration, of all effete matter, and where can we have such respiration as under the circumstances I have referred to?

Dr. Morgan (Nashville): No one doubts that the higher is our physiological condition, the more certain are we of success. Dr. Kingsbury says that we, as a people, have become so refined in our habits, that as a result, we have deterioration in the public health; that the habits of refined society are such that people cannot attain to and maintain that high physiological condition which they do under other circumstances. I think he gives that condition of life the wrong name; I do not believe it is refinement, I think it is dissipation. In regard to his assertion that there is a growing indul-

gence in alcoholic stimulants by the female sex, I will say that whatever may be the case in the city of Philadelphia—probably the special sphere of the gentleman's observations—I stand up to deny that assertion, so far as it applies to the sphere of my observation. It is not true of my section of the country, and I believe that in general, in polite or refined society, such habits, so far from being on the increase, are rather on the decrease.

I was not aware that dyspepsia is peculiarly a disease of our profession, nor do I believe that it is, or that it need be, if proper habits of practice and recreation be pursued.

As you are aware, I was appointed a member of this special committee. In going over the state of Tenessee, I find that within the last sixteen or eighteen years, fourteen dentists of my own acquaintance have died. Ten of this number died of consumption, and that in a state where statistics show that there is only an average of thirteen out of every hundred dying of that disease. Three of the remaining four died of urinary disease. If I remember correctly, out of eight who are now in bad health, six are suffering from lung troubles. Now this, to my mind, indicates a lack of exercise in the open air—insufficient out-door life, and I have no doubt that the want of good nourishing food, taken at proper intervals, contributes somewhat to the result. Dentists, as a rule, are irregular in their eating. Circumstances conspire to make them so. The constrained position in which we are compelled to stand much of the time, (for with all our improved appliances, the position must often be trying), is also conducive to disease of the lungs and abdominal region.

I was much astonished at a remark made by Prof. Flagg, as to the value of stimulants in the treatment of disease. I consider the application of stimulants in certain diseases as quite indispensable, for instance in typhoid fever and cholera, and no intelligent practitioner in my section of the country would attempt to treat either of these diseases in their more advanced stages without recourse to alcoholic stimulants.

Dr. Rehwinkel (Chillicothe, O.): I consider the papers presented and discussed here of immense interest, and the points taken are well taken; but I want to utter a word of caution against dentistry being held up as so unhealthful a profession, against exaggeration in this direction, for if that idea prevails, and is sustained by universal consent, we are such creatures of habit, that we will come to take it as a recognized fact, and submit to it as our fate. For my part it is a source of pleasure to me, and a matter of congratulation at these yearly reunions of ours, to find so few changes,—so much apparent well being—to find the friends I parted with years previous all looking so well and hearty. I have in my mind a gentleman now, whom I knew twenty-four years ago, then a handsome, but slender and delicate

person. He has been hard at work since that time, and has grown stout and fat. My own health twenty-five years ago was delicate; now I weigh fifty pounds more than I did then, and my health is seventy-five per cent. better than it was. If we all lived in the same climate, and under the same influences, we might lay down some general rules to be followed, and specify what is, and what is not deleterious; but we cannot lay down general rules which shall govern men irrespective of temperament and locality. I desire to sustain Prof. Barker so far as stimulants and tobacco are concerned. I occupy the same position that he does. I do not by any means advocate or recommend their use, but I would not decry men who use them in moderation.

Prof. Stellwagen (Philadelphia): In the different positions taken by different gentlemen here, each one has a certain amount of justice on his side. I understand Dr. Barker to mean that the use of alcoholic beverages, as prescribed by physicians, is sometimes necessary to stimulate the digestive apparatus. We know that in order to perfect bodily health, the new material which is taken into the system in the shape of food must be taken up and properly assimilated. Occasionally, however, this assimilative power becomes slightly dormant, and then it is advisable to use, for the time being, some kind of a stimulant, and alcoholic stimulants are advantageous in such cases, as where our friend from Tennessee recommends it—in typhoid fever; but it is only to serve a temporary purpose. It is as if, for instance, we had a large and valuable bridge over a river burned down, and should erect a temporary structure to take its place, simply to accommodate the tide of travel until we could rebuild a more substantial one. But, while it is useful in exceptional cases, as a medicine, no physician should ever make use of a drug so powerful for evil as well as for good, without first controlling the use of that drug by ordering it in a certain stipulated manner, and in a certain dose—to be repeated so often—and then stopped. That is my idea of the use of alcoholic stimulants. I hold that it is unsafe for a man to subject himself to any stimulus after he feels once or twice a return of the appetite for that stimulus at any particular hour. If I were to order alcohol in any of its shapes, I should follow it up as cautiously and carefully as I should follow up any of the more dangerous cumulative poisons on administering them. I should ascertain from my patient whether, at the time of administering the dose, his appetite craved the stimulant, and if so, I should advise him to avoid it as he would the sting of a serpent.

We find those living in malarial districts who can work a certain number of months with impunity, and then they are obliged to seek health in more elevated sections of country. Another man works in a region where, so far as climatic influences are concerned, he can devote himself uninterruptedly to his profession; but his professional application is so intense and constant

that when the time for the summer vacation comes, he finds himself broken down and debilitated generally. Now this has always seemed to me a highly prodigal way of living. A person cannot safely or prudently work down his health to low water mark, and then rely upon a period of rest and recreation to bring it up again. Persons who use machines know very well that when a machine needs oiling, it is better to stop the whole machine—the whole factory—to oil a single journal, rather than run on until it is over-heated and burned out. The human system needs constant alternation of labor and rest. My practice has been (my experience and observation confirm me in the belief that it is a good one)—my practice has been, to take one afternoon of every week for recreation in the open air, and I have never broken over this rule except in two individual cases. Recreation should be of such a character as to divert the mind from the ordinary routine and cares of your professional duties. It should be the habit of a dentist to throw off entirely business cares after business hours. This is an important lesson for us to learn, and an important one for us to apply in our daily life. It is the constant uninterrupted attrition of business care which wears out and breaks down the machine.

Dr. Thomas (Detroit): There are one or two points to which I desire to call your attention. The first is, the matter of eating. For some eight years I was in the habit of having my dinner at 1 o'clock. My residence is just a mile from my office, and I was in the habit of walking to and from my office at dinner time, but I am satisfied that during that eight years I did four times as much walking as was good for my health. I frequently walked from three to six miles a day, and stood at my chair eight or ten hours besides, and a year ago last spring I was obliged to leave my practice, as I supposed, forever, as I was suffering severely from general debility and nervous prostration. Upon leaving my practice I changed my mode of life. I abandoned walking almost altogether, and my health began to improve, and kept improving until I was able to resume my practice. In regard to eating, I desire to say that I have been in the habit of going to my chair at eight o'clock in the morning, and practicing continually until two o'clock. Then I have an hour I call my consultation hour, which I devote particularly to that class of business which comes in upon us during the day, and which we do not wish to have break in upon our operative practice. I attend to that from two until three, and then I have dinner. I have followed that rule for several months, and I find it to be greatly to the advantage of my health.

I was very glad to hear Dr. Barker say that our profession is not the hardest one in the world in its practice. I do not believe it to be so. I think the multiplication and perfection of dental instruments is such that our profession has been rendered comparatively easy.

In regard to this matter of intemperance: I believe the nearer a man can live to temperance, the better it will be for him and his patients. At all hazards he should be temperate; but at the same time I do not sympathize with the anathemas which some pronounce against spirituous liquors.

Dr. McDonnell (Conneautsville, Pa.,): I can endorse quite heartily the views expressed by Dr. Allen in his paper. Yet, I think he may be misunderstood in some of his points. In regard to the use of liquor; I do not suppose he desired to be understood as condemning its use as a medicine, but merely as a beverage. I do not, however, agree with Dr. Morgan, in saying that all intelligent physicians in the South recommend the use of liquor in cases of typhoid fever. In the section of country in which I live there are many physicians—homeopathists—who do not use liquor in such cases, and I think, as a general rule, they have as good success as allopathists. My idea is that the health of the dentist is best promoted by a careful attention to hygienic laws—by getting sufficient sleep at the proper time, and under favorable circumstances, by eating sufficient good food at the proper time, without the annoyance of such interruptions as professional calls, while taking it. The idea of having the office and residence combined, I do not consider a good one, inasmuch as it subjects the dentist to constant annoyance of that kind. I have tried both ways, and I find that an office separate from my residence is much more preferable.

Dr. Stockton (Newark, N. J.): I presume it will be remembered that last year, when this special committee was appointed, it was done in view of the supposed fact that a large number of dentists were becoming insane. Now, in the discussion of this subject, we have gone widely astray of the primary idea involved in the proposed investigation, and have taken up almost exclusively the subject of intemperance. Confining myself to the original idea, I desire to say that I do not think there is anything in our profession peculiarly calculated to produce insanity. I think that dentists, as a rule, are as healthy as members of any other profession, and I can say this with special emphasis if I base the statement upon the robustness of appearance presented by the representative body which I see before me. There are, it may be, some things connected with our profession that do lead, in a measure, to this result; but they should be, and for the most part can be, avoided. There is nothing so conducive to a healthy tone of mind and body as an occupation which is congenial to the taste and temperament of the person following it, and if a person finds himself in an occupation which is repugnant to his tastes, he should abandon it, whether it be dentistry or something else, and pursue one which suits him.

There are some patients for whom we can work with much greater ease than for others; some, in fact, who exercise a specially depressing influ-

ence upon us. Such cases it is a matter of wisdom to avoid treating, as far as we can. Frequently cases come before us which we feel we could treat much better at another time, and I believe a man would do better by suiting, as much as he can, the operation to his state of feeling.

It was said this morning that we must be in perfect health in order to produce the best results. I have in mind now the case of a gentleman who has been weak all his life—having a physical organization of the most feeble kind, who, nevertheless, has done some of the most perfect dental work which I ever saw. That shows that perfect physical health is by no means necessary to perfection of work, although I will admit that it greatly conduces to that result.

Prof. Smith (Philadelphia): I am not aware of any statistics by which we may judge of the healthfulness or unhealthfulness of dentistry as a profession. The remarks of Dr. Morgan this morning, perhaps approach nearer to what I supposed would be accomplished in this paper, than any thing which has been said. This is a very interesting field of statistical investigation—to ascertain definitely whether dentistry is a healthful profession or not. I have always regarded it as a profession tending to the abridgment of the life of its practitioners. Of other professions we have statistics. Of the three—clergymen, doctors of medicine, and lawyers—clergymen are the longest-lived, physicians come next, and lawyers next. Now, the relation which dentistry bears to these three professions, it seems to me, would be interesting and important. Of one thing, however, we may be assured: true advancement in civilization and mental culture tends to longevity. I know the remark was made this morning that the people of the present day are living on too high a plane of civilization; but it will be found that the people which attain to the highest mental culture attain the greatest longevity; and that which is true of a people, is also true of a class of people.

So the longevity of dentistry, or the lifting of dentistry from a position of unhealthfulness to one of healthfulness, is due not so much to improved implements, as to an advancement in intellectual attainments—to a general development in intellectual culture. To this end, societies like this have greatly contributed; they have lifted dentistry from a position of obscurity to one of great respectability. It is only a few years ago—1839—that the first systematic effort was made to educate for this special calling, and the result has been the establishment of local societies, the establishment of this society, the establishment of dental colleges all over our land, and the elevation of the tone of dentistry throughout the entire country. It is to this fact more than to our use of improved instruments that is due the increase of longevity among dentists. Dental colleges have done much, and it remains for dentists to say what they shall accomplish in the future. It is not alone their object to teach men to preserve the human teeth. They are

to educate men in every department of medicine and in every department of true manhood, and just in proportion as they do this, will they lengthen the lives of dentists.

Dr. Atkinson: It seems to me that the proper way of reaching the truth upon this subject, is to lay aside our partisan feelings, and endeavor to get at the foundation of what constitutes food, what constitutes poison, and what constitutes remedy.

It is dogmatically asserted here, on the one hand, that alcohol contributes to the construction of human tissue, and on the other hand it is just as dogmatically asserted that it is a poison. The last speaker has so asserted: but I think it would be difficult for him to intellectually justify that assertion. We do not as yet know enough of molecular metamorphosis to entitle us to dogmatize very much about what becomes of certain substances which disappear from our cognizance when introduced into the human body. Now, competent authorities who have experimented upon the introduction of alcohol into the human system, assert that some portion of it is capable of being collected from the different ejecta of the animal system, but there is also a loss—a reduction of the quantity, concerning the disposition of which in the animal economy, we are quite uncertain, but it yet remains to be settled whether it is appropriated as nourishment or not.

I think there has been a drawing of very weak conclusions upon the question of whether our profession conduces to health or to disease. Over-action or under-action of any machinery will be detrimental to that machinery, and the human organization, varying as much as it does—the human mentality, and desires and esthetic nature differing as they do, it is difficult for us to set up a standard to which we shall come. In other words, each man who is fit to practice dentistry at all, is entitled to be the best judge of how much he can endure, with safety to himself and to his patient. If I were asked for a rule of action on the subject, I should give the rule of banking—never to draw all the deposit you have in bank—always keep a surplus. Now, what is the function of alcohol? It is to quicken depressed functional activity. When a man has spent the last deposit of his energy, if he would then take a little brandy and water into his stomach before he puts food into it, he would be better off than he otherwise would be. If I were talking to an assemblage of chemists, and should ask the nature of diffusible stimulants, I should at once receive the answer—something that exists, but which is not quite understood. It has been called catalysis, or action by presence. We may take red pepper, or black pepper, or ginger, or any other diffusible stimulant, and get like results. If I were within reach of oranges, I should prefer the juice of three well ripened oranges to take into the stomach before food, to stimulate the digestive function of the stomach.

As to our profession being particularly detrimental to the organization,

I think that is not so. I conceive it to be the profession of professions to awaken all the energies of the entire human being, and if we were up to the requirements of it, we should be the very tip-top blue blossom of humanity! We should be the culmination of all science and all art.

Dr. McQuillen: As was justly remarked by Dr. Rehwinkel this morning, a statement that is made and passes unrefuted, however lacking in foundation, will eventually become accepted as true. Like him, I am disposed to take exception to the position assumed by my friend Allen, that our profession is peculiarly exhausting to the mental and physical energies; and particularly to his statement that our profession tends strongly to insanity. I remember last year he cited several instances of insanity in dentistry, giving the names of individuals. It struck me at the time as exceedingly out of place to mention individual cases, inasmuch as the parties are dead, and it would be a source of considerable mortification to their friends to have their names thus published to the world as dying insane. At my suggestion the names were suppressed by the editor of the Dental Cosmos, and I think the same course should be pursued now. So far as predisposing causes to insanity are concerned, I think they do not exist to a greater extent under a high state of mental excitement and activity, than they do in the rural districts where there is the least amount of excitement and activity of the brain. So far as statistics are concerned in connection with insanity, it will be found that that disease prevails to a greater extent in the rural districts—among farmers—than in any class of the community. I do not consider our profession more exhausting than any other calling which is followed with that devotion of purpose and determination necessary to secure the best results. Wherever we find men devoting themselves assiduously to their calling, we are apt to find many of them falling martyrs to their over-zeal.

DENTAL PATHOLOGY.

[NOTE.—The report of the regular committee being called for, was presented orally by Dr. J. H. McQuillen, chairman. As he has failed to place it in the hands of the publication committee, its insertion in the proper place is necessarily omitted.—SEC.]

DISCUSSIONS.

DR. SHEPARD: In connection with the report of Prof. McQuillen, I would like to instance the case of a family with which I am acquainted, in which there are two boys. One of them commenced to erupt the temporary teeth at four months, and at eight months had eight temporary incisors. His brother did not have one until he was eight months and a half old, and when he was a year old he had five incisors only. This is a simple illustration of irregularity occuring in the same family, in the same blood, and under the same physical regimen. The boy first cited, at three and a half years of age, had thirteen cavities filled in his molars. I know of no reason for this tendency to decay, except possibly the early eruption and consequent imperfect calcification of the teeth.

DR. PEIRCE: We all recognize the difference in time between the eruption of the permanent and deciduous teeth. Now the question comes up whether there is a difference in the development of those teeth, or simply a difference in the time of the removal of the gum from the surface. Dr. McQuillen spoke of teeth being erupted at birth; I have known two or three such cases where there were two teeth erupted, but those two were not any further developed than those which had not erupted. In my family, one of my children had teeth through at two months, another not until six months of age. In the first there was some peculiar condition of the system and the gums, but so far as I know there was no difference in the condition of the teeth in the two cases. In regard to the difference of time in the eruption of

teeth between the European nations referred to and the United States; when Mr. Tomes was here, and also when I was in London, I saw and spoke with him upon the subject—respecting what we term the seven-year old teeth. In London, parents put their children at work in factories as early as possible. There is a law that no child shall be considered seven years of age until those teeth are erupted, at which age they are allowed to work in the factory. The same law prevails to a certain extent in Paris. I think that Mr. Tomes recognizes the fact that those teeth are through in a majority of cases at six years of age or shortly after. Whatever of premature development there is, I think is due more to a prematnre absorption of the gum from the masticating surfaces, than to any development of the teeth.

Dr. McQuillen: I neglected to say that Saunders makes use of the eruption of the teeth as a means of determining the age of children. The law that was passed through the instrumentality of Sir Robert Peel, did prevent the employment of children at a very early period of life in factories. The order and time of eruption of the teeth was made the subject of investigation, with a practical object—that of ascertaining whether the law was being violated or not.

Dr. Atkinson: There is a point in the development of the teeth which has not been referred to, but which I regard as one very important for dentists to know; that is this: there is a certain relation between the time of the shedding of the temporary teeth and the time of the breaking down of the whole system—the term of longevity. Twelve times the period of the shedding of these teeth is the normal limit of the life of the individual. All tissues are made up of elements that have an origin at one end of the fibre, and the longevity of the fibre depends upon the possibility of the increment of the elements at the inner end of the fibre of the tissue, in other words, the wearing out of the fibre. I can confirm the statement made by Dr. Peirce, that a premature eruption of the tooth does not indicate any special development; it only indicates that the operculum or outer wall of the sac in which the tooth germ is hidden, has lost its capability of appropriating the blood corpuscles, constituting the basis of the cells, and has given way, leaving the tooth exposed. I have a daughter that had one exposed in that way, and I removed it, because of the irritation produced upon the nipple of the mother in nursing. We must understand that progeny is not the product alone of the immediate father and mother, but the product of a long ancestral line of endowment of life.

Now what is the law of evolution of the tooth, and is it, as Prof. McQuillen said, a matter that concerns the individual tooth itself, or its surroundings—an act *per se* of the tooth itself, independently of pressure, or the presence or absence of any other agent? He said it was not a result of

the carneous body; I do not think he can justify that statement. I have yet to see any absorption of bone even, much less of tooth structure that has not a carneous body directly against it. What is a carneous body? It is simply a confluence of the cells of the tissue, like the breaking together of two soap bubbles into one, and they are always present where bone is absorbed, whether there be a healthy or an unhealthy action. Now, that it holds any relation to the absorption, I am not prepared to say. I am not prepared either to endorse the statement that it was not dependent on an acid secreted by the carneous body, or produced by it. I do not think we know what that process is; I think it is physiological, but it may be pathological.

Dr. Francis (New York): I simply desire to call attention to one single statement in the report of Prof. McQuillen—a statement which I have heard made before repeatedly; it is this: that the absorption of the roots of the deciduous teeth is in no wise caused by the pressure of the point of the permanent tooth; whether this is so, I am unable to say, but I will state this: that when a permanent tooth takes a direct perpendicular course, and impinges upon the point of the deciduous tooth, we find that the root of the deciduous tooth is absorbed away; when it takes an anterior direction, we find simply the anterior point of the deciduous tooth absorbed away; when it takes a posterior course, we find the posterior portion of the root absorbed. We find also occasional cases where the temporary canine teeth remain for years, the permanent canine tooth taking its place by its side, and no absorption occuring. It has always seemed to me that the permanent teeth did, in some manner, assist in bringing about the absorption of the deciduous teeth.

Dr. Atkinson: I do not think Dr. Francis meant to be understood as saying that when the impingement was upon the point of the root, that absorption takes place at the point. It never takes place at the point though it may take place a little to the one side or the other. If it ever does take place on the point, it cuts off the supply to the pulp of the deciduous tooth, and that is the end of the absorption. Now, when the fang does not absorb, it is chemically destroyed—never mechanically, never vitally destroyed.

Dr. Morgan: I am gratified to hear Dr. Atkinson take that position. It is not long since he gave me a sharp reprimand for taking the same position. I insisted that absorption was a physiological action, and that when devitalization had taken place this process was discontinued. There is something in the pressure of a coming body which is always necessary to the absorption of the roots of the teeth. I am satisfied that you will find in the

case of supernumerary teeth coming against roots which are developed late, that it will cause them to absorb more or less, and sometimes cause the loss of one entire root of a tooth that has more than one root. The discrepancy between the observations in this country, and the observations in other countries, long since attracted my attention. Such differences may be due to climatic influences. We all know that as we go southward, and approach the equator, there is a more rapid development than in more northern climates, and we read of maternity at ten or eleven. I once knew of twenty-eight permanent teeth being erupted at the age of eight years.

Dr. Abbott: This is to me an extremely interesting subject. We have all seen cases similar to that cited by Dr. Morgan. I had one identical in condition with the one spoken of by him. I saw the patient not more than two months ago; the teeth were in a good condition—better than the average.

In regard to the absorption of the roots of teeth, it has seemed to me that we have, instead of pressure, what might be called a physiological action taking place constantly, which produces an absorption of the roots of the tooth. That the material absorbed is taken up, as some writers assert, and applied to the formation of the next tooth, I have my doubts. It has always seemed to me that the process is the result of physiological irritation, and whether it occurs at the point of the root or elsewhere, the result is the same—absorption of the tooth. There is always space sufficient between the temporary and permanent tooth for a considerable quantity of pulp-like substance, and I have never known sufficient pressure upon the end of the tooth to destroy the pulp. In regard to the absorption of the roots of teeth where the pulps are dead; in some instances I have seen cases where I thought absorption had taken place. I have a case on hand which I am watching with some interest—a child, two or two years and a half old, which fell against a chair, injuring the central incisor, and causing the death of the pulp. I want to observe whether there is any absorption taking place; there could not have been much, if any, at the time the pulp was destroyed, and it will be interesting to ascertain if any takes place afterward.

Dr. Kingsbury: I think, with Dr. Atkinson, that absorption in the roots of deciduous teeth never takes place after the pulp is devitalized. So far as my own observation has extended, I am fully satisfied that the root of a tooth is never absorbed when the pulp is devitalized, and I think the presence of the carneous tissue, in connection with the root, is a necessary condition of absorption.

There is another point: Whatever may be the immediate cause of the absorption of the roots of the deciduous teeth, the permanent teeth do certainly seem to bear an important relation to that physiological action. In a

great many cases of retarded dentition, we find that the roots of the superior deciduous cuspidati remain in the jaw unimpaired or unabsorbed, to mature life. In such cases, doubtless, the germs of the permanent teeth are wanting, and the reason why the roots of the deciduous teeth, in such cases, are not absorbed, is in consequence of that relation which the development of the permanent tooth bears to its predecessors.

Dr. Flagg: I had supposed it long since settled that absorption is a vital process, and I always supposed that if a tooth be devitalized, the process of absorption would necessarily stop. There might possibly, for a limited space of time, be an absorption of the outer portion of the root; but such microscopical forces are hardly to be considered.

I consider this carneous body a concomitant with absorption. I do not believe absorption is ever carried on without the presence of this concomitant carneous body.

Whether it is a necessary element in that process, or whether absorption does not tend rather to produce the carneous body, are questions which I have no means of determining. If there is not vitality in the tooth membrane, it would simply be disintegration. If the pulp of a tooth is devitalized, true absorption can not take place in the tissue; there may still be a breaking down of the structure, but that breaking down is not in consequence of absorption, but is due to other causes. Now the roots of deciduous teeth, after the pulp is dead, disintegrate at a slow rate. They are, in such cases, shed by actual pressure from the coming tooth, and we find no intervening carneous body. We find the tooth coming out frequently with its roots absolutely astride of the crown of the tooth behind it.

In regard to this idea of the absorption of the temporary cuspids, it has been my misfortune to have brought to my notice several very serious mistakes, one of which opened my eyes in regard to the matter.

My practice has been to keep in place the temporary cuspids until such time as they are so loose as to become an annoyance, because, if in consequence of the usual indications of the eruption of the permanent tooth, such as swelling of the gums, etc., the temporary cuspid is extracted, it may prove a very premature act, and the permanent cuspid may not erupt for years.

In regard to the relative time of the eruption of the teeth in Europe and America, I believe Prof. McQuillen states the time in England for the eruption of the six-year old molars to be from five to seven years. That, it seems to me, is not different from the time at which they erupt here.

Indeed, I do not see the practical bearing of the facts which have been presented, relative to these differences in dental development. That certain teeth should erupt in some countries at ten years of age, and in others

at six or eight, is no more strange than that maternity should be attained at seventeen or eighteen years of age in one country, and be equally normal at eleven or twelve years of age in other countries. As a nation, we are precocious, and it is not at all strange that our teeth should share in the general precocity of development. But, at the same time, it is highly desirable that the dental student should have an accurate knowledge of the development of the teeth, in order to form rational opinions on cases of irregularity.

Dr. Butler: Dr. Francis, I believe, said that the roots of permanent teeth were absorbed. I believe that to be so. Dr. Atkinson spoke of certain peculiarities of the teeth being derived from one side of the house, and others from the other side, and said that they furnished indications of the longevity of the individual. I have in mind the case of a boy belonging to a family, where on the mother's side, they are all dying of consumption, while on the other side they are quite robust. When the lad was about twelve years of age, a cuspid tooth began to make its appearance, the point of the crown turning to the right, over the anterior portion of the root of the left lateral, perhaps one-fourth the way down from the apex, the pressure coming across the root in that position; the lateral soon began to grow loose, and continued to grow looser and looser. After a while there was an abscess formed, when, taking the lateral out, it was found that there was quite a channel cut across it. Here was a case of absorption from pressure, a channel being cut quite across the root.

Dr. McQuillen: I desire to say, in response to my friend Atkinson, that the subject which I presented was distinctly limited to the eruption of the deciduous and permanent teeth. The reference which I made to the absorption of the teeth was in the most incidental manner possible, and I do not think any one who listened to me attentively, could have understood me as saying emphatically and distinctly that the carneous body does not absorb the teeth—that pressure does not absorb teeth, and that it is a case of retrograde metamorphosis. I said I had reason to believe that a carneous body is not necessarily the agent, and that it is reasonable to infer that it is not affected through pressure, but through retrograde metamorphosis. I trust I have been too long engaged in the study of physiology to indulge in anything like dogmatism on this subject.

VOLUNTEER PAPER

ON

DENTAL PATHOLOGY & SURGERY.

By W. N. MORRISON.

In a recent number of the "Cosmos," is the report of an operation by Dr. Garrettson, for the removal of a section of the inferior dental nerve. Without commenting on the operation, I wish, briefly, to give a little experience in similar ones.

About three years ago, Dr. Hodgen, a surgeon of St. Louis, called at my office, requesting the loan of some heavy cutting excavators and chisels, to enable him to perform such an operation. I told him I thought the old operation was unnecessarily severe and formidable, and that with the assistance of a drill and burs in the dental engine, it could be equally well done and leave no external wound. I accordingly made a drill about one and a quarter inches long with a thin blade that would bore a hole about three-sixteenths of an inch in diameter; also a coarse-cut round bur, about the same length, and one-quarter of an inch in diameter, and with the engine went to the patient's residence. She was an old lady, nearly seventy years of age, and toothless; had suffered with intense neuralgic pain for twelve years. A hole was drilled, corresponding in position and direction to the place where the third molar stood, the hole being carried downwards and outwards until the inferior dental nerve-canal was reached, when it was enlarged by the bur, and as much of the nerve destroyed as could be, by passing the bur anteriorly and posteriorly in the canal fully half an inch. When it is desirable to remove a section an inch or more in length, another hole can be bored the proper distance forward of the first, and of course

there will be no pain, as the nerve is severed by the first operation. The section can be removed through the anterior hole by an untempered hook-shaped instrument. This operation, often very severe, can be performed through an opening not larger than that resulting from the extraction of a bicuspid. This, in the case referred to, secured complete relief. These cases are rarely presented to the dentist, though he is better qualified than a surgeon to treat them, being accustomed to operations in the mouth. A number of similar operations, performed at different times since, have resulted in perfect success.

REPORT OF THE

COMMITTEE ON DENTAL PATHOLOGY.

BY J. FOSTER FLAGG, CHAIRMAN.

Mr. President and members of the American Dental Association: It is with no intention of presenting a lengthy report upon the subject of dental pathology, that I rise to represent this committee upon this occasion. Not but that we fully recognize the importance of the branch intrusted to us; not but that we well appreciate the advance already indicated as the reward of thought and labor; but, that we feel, as yet, far more the need of other things than simply recapitulating the varied and opposed experience of many men, in many things, for many years.

At Cleveland, some fourteen years ago, the question was quite pertinently, asked, "what have we worthy to be called dental pathology?" And still the query seems unanswered, for even yet, so much discrepancy exists, such diverse views are entertained, and such inexplicable difference of results is reported, that the "best men," (as they are invidiously termed,) are found upon our floor arrayed as foes, and lesser lights must fain content to grope in darkness.

Now this ought not to be—for what is truth is truth—and what is false is false. That which is true, cannot be false, and that which is false, cannot be true.

It has therefore seemed to us as most appropriate, that our Centennial suggestion should point to a new departure, which, before another hundred years, might tend to unify the views of all, in relation to mooted points of daily practice, and thus establish a firm foundation upon which to rear the future pathology of dentistry.

As we discuss with fellow practitioners, the views of constantly recurring conditions; as we hear enunciated, with the force of firm conviction, ideas

diametrically antagonistic; as we read, in our several journals, actually consecutive articles, each bearing a signature we would delight to honor; each giving ample evidence of thought, of earnestness and of experience; each advocating views condemned by others, and deprecating in no measured terms, the practices extolled by some, we feel the more inclined to urge upon this body, that such action should be promptly taken as would tend to stay this seeming utter waste of energy.

It seems to us that all these workers still should work: that ardor should not cool, nor zeal be moderated; but that some means should be devised by which the danger of *losing sight of truth, in sight of self*, may more be overcome, and ways be offered that shall end in cheerful gifts of individual effort to a general fund, from which such solid rules might be deduced as would result in most extended individual benefit.

We are aware that history repeats itself; and thus we hesitate the less to urge again the value of statistics and committees; but this we beg to offer only as "suggestive," and yet, we cannot but suggest that much might well be done by means of these invaluable agencies.

We are equally aware of the oft-times sad results which follow the appointment of committees, but we must be permitted to present the view, that in all matters of such moment, it might be well to organize those analogues to committees which are termed "sections," which are not only possessed of the permanence of standing committees, but which are endowed with that vitality which springs from an almost equal permanence of membership.

It has not been overlooked by us, that in years past, the errors of individualities have been engrafted upon even these hard working and wonderfully productive adjuncts to "association" effort, but it has been our pleasure to note that the spirit of investigation and the growing desire for *truth* seem to be rapidly proclaiming themselves as the legitimate offspring of general education.

Upon this is based our hope that something worthy of our loved profession may eventuate from years of patient labor on the part of a well organized "section of pathology." Upon this is based the firm conviction that, perhaps, more than in any other way, may such result accrue as will tend to elevate our calling in the scale of usefulness to suffering humanity.

Surely there is need for this; much as has been done, there is room for plenteous increase; great as has been our advance, the path which we have trodden is as nothing to that which we may hope to tread; vast as is the amount of pain which we can now assuage, it may be rendered vastly more.

But with all this, it seems to us, as though the time had come, when, *if it be possible*, all our pathological differences should be reconciled; as a pro-

fession, we are at wide difference upon many points—far too many for our own, or for our patient's good—and this we would have rectified.

To this end we ask for the adoption of our report; to this end we trust that it may be instrumental in working much good, and most sincerely such we shall hope, will be the tendency of our suggestion.

That it may benefit each and every one of us, and, through us, vast numbers of our fellow-creatures, is the earnest desire of your committee.

[The suggestions of this report were acted upon, and a committee on "sections" appointed to consider the matter. See pp. 14 and 20. Sec.]

DISCUSSIONS.

Dr. Shepard (Boston): I have been interested in the operations of Prof. Goodwillie, of New York, in connection with this subject. He has performed a number of operations by means of what he calls a multiple knife, which is a kind of bur. Some of these burs are an inch in diameter, and from that down; each cutting edge is made very sharp. The engine is also of a peculiar construction; it has a large driving wheel, so that a velocity of two thousand revolutions per minute is attained. In this way he can cut into osseous tissue with perfect ease. It is particularly useful in removing necrosed bone. In one case a patient had been afflicted with necrosis of the vomer; there was a small opening through the hard palate, and he removed the vomer without any enlargement of that small opening, passing this multiple knife through an opening about one-third of an inch in diameter. Knowing the anatomy of the part, he is enabled to remove just as little or as much of the bone as he thinks necessary to the success of the operation. I think there is, in this instrument, in the hands of a surgeon, a great field open for improved surgical operations.

Another operation of Prof. Goodwillie's, was the removal of a large osseous tumor, which made a large bunch upon the face; he removed it without any external opening—simply by the same means—through a little opening to admit the bur, securing a result which was an extermination of the disease, and a restoration of the contour of the face.

Dr Barker: I cannot see what is to be gained by the use of the instrument as indicated. Every one who has had any experience in surgery knows that one of the first things to be avoided is the use of any irritant. I do not understand exactly the operation of these instruments, but I cannot possibly conceive how such a bur can be used without leaving a consider-

able amount of material in the cavity, so as to give rise to irritation. It is nothing more nor less than an instrument for cutting away certain portions of dead tissue, which must be exposed, not to the external view of the person standing by, but brought to the touch of the surgeon who operates. There are cases of superficial wounds, capable of being cleansed, where, I presume, this instrument may be used advantageously, but in a deep-seated wound I cannot see how this can be done.

Dr. Flagg: I think Dr. Barker's objection to this instrument is hardly well taken; he admits that he does not understand the use of the instrument, and upon that admission he is hardly entitled to set up as a critic upon its merits. I think we have in this something destined to work a great revolution in surgery. I have found that in excavating such cavities as we are in the habit of doing about the jaws, inside the face, I can make large cuts and deep incisions much better with a rapidly revolving instrument. Only yesterday morning I was operating for a patient of an exceedingly nervo-bilious temperament, with very sensitive dentine. I put three cells of a battery on my instrument, and got up two thousand revolutions a minute; then I used a small seven-bladed bur, and in almost no time I had cut in pieces the whole mass of sensitive dentine. I would say in regard to a driving-wheel that it is quite a valuable adjunct. If we have a motor to use with our engine, it will be found of great advantage; it is very little trouble or annoyance, and gives us a steadiness of motion which no one can get with the feet.

Dr. John Allen: In connection with this subject I wish to refer to a case that I had some six or eight months since. A gentleman, some forty-five years of age had been suffering much from neuralgia, having consulted several physicians to no purpose. The optic nerve at length became so affected that he lost his sight almost entirely. He came to me, and asked if I remembered operating upon his teeth some years previously, and my telling him at that time that he would have a wisdom-tooth come through at some future time from the lower jaw. I had forgotten the circumstance entirely. He then said, "I think that tooth is coming through." I examined the jaw, and found it was indeed making its appearance. Upon my advising it, he consented to have the tooth removed, and I accordingly extracted it. After the removal of the tooth, the jaws continued for a time as they had been before, very stiff, so that it was difficult for him to open them; gradually, however, they got better; his sight also improved, and finally he got so that he could see quite well. The whole difficulty here, in my opinion, resulted from cutting that wisdom tooth. The inflammation produced in the maxillary process by sympathy, was extended to the optic nerve, inducing partial loss of sight.

Dr. Rehwinkel: I have been in the habit of using a trephine as a kind of last resort in cases of alveolar abscess, where it was simply a matter of choice between this and the removal of the tooth, and cutting off the apex of the root. I have used a trephine with the engine, and also with hand power, which I prefer in such cases, for the reason that one can operate with much greater precision and certainty in that way, knowing exactly when and where you have struck the root. I can operate much more rapidly however, with the engine, and I do not know whether it makes any great difference we go a little beyond the point into the maxillary bone or not. I have performed the operation several times with perfect success, and I think it is preferable to extraction and replantation, and it saves the patient all the pain and inconvenience attending that operation. Then, again, in excisions of the maxillary bone for tumors, I think a circular saw, with proper protection to the cheek, might be used very advantageously. Surgeons even to this day recommend bone-forceps for cutting transverse sections of the alveolar process. That is an operation which I never could approve. It always seemed to me barbarous to crush the bone with a pair of cutting forceps. I should always prefer to have it cut with a circular saw.

Dr. I. Knapp: In regard to the eye being occasionally implicated by sympathy, in diseases having their seat in the teeth, I have a case which may not be without interest. A gentleman called upon me not long since with a severe inflammation of the left eye, and in speaking of it he told me that there seemed to be an intimate connection between that eye and the first superior molar; upon examination I found that the external roots were much exposed and covered with tartar. We made, as we thought, a thorough cleansing of these two roots, but the patient came back each time with the trouble in his eye much aggravated. I was sure that there was still tartar upon the roots of the teeth, from their roughness when I passed an instrument up. I therefore slit the gums up completely, and made an effort to entirely remove the tartar from the roots. After doing the best I could, and making an application of aromatic sulphuric acid, I dismissed the patient. He did not return, as he promised, and I did not see him for some two weeks, when I met him on the street. He said the last effort was effectual, his eye having got well. The conclusion I arrived at was that the tartar had gone on until it reached the foramen, affecting the nerve communicating with the eye.

Dr. Abbott: I have recently had quite an interesting case to treat. A gentleman was sent to me by a prominent physician of New York with what was supposed to be a very severe abscess, resulting from the death of the lateral incisor, canine and bicuspid teeth. I examined the case and

found that there was dead bone there, considerable of which I could remove easily. I removed some of it, and gave him a diagnosis of his case. I then removed the anterior plate from the central, lateral and canine on the right side, and beyond that over the bicuspids it was sound. Some days after this I examined the apex of the bicuspid, which I found was stuck up into an open cavity a little over an eighth of an inch in size, and I found two pieces of bone, as large as the end of my finger, which had exfoliated, and which I removed. This, however, did not help the case much. Upon a further examination, I discovered what appeared to be dead bone in the right nostril. I accordingly inserted my instruments into that nostril, and succeeded in removing the bone entirely. Then I went on applying a weak solution of carbolic acid, and the case, when I saw it last, was nearly well.

DR. STELLWAGEN: It may not be in order to introduce the subject of veterinary surgery here, but I have a somewhat interesting case in that line which I would like to relate; a case, which, so far as I could trace it, seemed due to an alveolar abscess about the root of a horse's tooth. The singular part of it was that the abscess had broken upon the nose of the horse, about midway between the nostril and the eye, working its way upward through numerous layers of bone in a direction entirely contrary to that which we usually see pursued in such cases. We succeeded in taking out one or two of the animal's teeth, which allowed the abscess to discharge into the mouth, and the case was then very shortly cured.

What I rose particularly to call attention to, however, is something that I do not remember to have heard brought up as yet. I allude to meterological conditions, or atmospheric conditions, as pathological agencies. Although I have been for some time accustomed to observe barometrical conditions and changes, yet my attention has been particularly called to this within the past two or three days, when I have had two or three quite severe cases of neuralgia, which I think are due to such conditions.

I would like to ask gentlemen present if they have observed that the destruction of a pulp, or the capping of a pulp, is very frequently accompanied by unusual neuralgic pains,—reflex pains,—pains attributed to other teeth or other parts of the system. There are some wonderful cases on record where an exposed pulp has produced neuralgia in the arm, in the trunk, and in the head. From a series of operations which were made and recorded, together with a series of observations of meteorological conditions of the atmosphere, at the Penn. hospital in this city, a paper was written, wherein we find the following deduction: that in surgical operations, success was more rare with a falling barometer than with a rising one. This is logical, for under a falling barometer we are necessarily losing tonicity, but with a rising barometer, tonicity is being improved. I would like to know if this agrees with the experience of gentlemen present.

Dr. Bogue: Just in that connection I would like to ask Prof. Stellwagen whether he has noticed a fact which has been remarked by several gentlemen, viz.: that during the prevalence of the extreme warm weather of this season, there were more abscesses on hand for treatment than usual during the summer season?

Dr. Stellwagen: I did notice it. It was markedly the case. During the past winter I likewise noticed a very curious case. A gentleman in the early part of the autumn placed himself under my care, and I filled a number of teeth for him. In the latter part of the fall, or early in the winter, he was attacked by typhoid fever, and when very ill in bed sent for me. I found, upon an examination, that the pulp of one of the teeth which I had filled had succumbed, in part, perhaps, under the irritation produced by the filling I had introduced, together with the low state of his system. I treated it with simple dressings, and allowed the tooth to remain. A few days afterward I was again sent for, the patient complaining of neuralgia on the other side of the head. I examined and found a filling which had been put in some time before. I drilled through that, and found the pulp affected, as in the other case. This was to me a very instructive case; it showed me how dependent is the whole dental arrangement upon the general system. This gentleman's tonicity—his vitality—was lowered by his typhoid condition, and, as a consequence, his teeth began to give him trouble. Now, anything that lowers the tonicity of the system produces a like result, and therefore it is that there is such a marked increase of abscesses, etc., during extremely hot weather.

Dr. Morgan: In the locality in which I reside, about one-third of the population pay very little attention to the teeth, and they have, constitutionally, badly organized dentures. I have been accustomed to notice the effect of changes in the barometrical and thermometrical condition of the atmosphere upon the teeth of this class. June I found to be the worst month in the whole year for tooth-ache. I find a sudden change from cold to warm weather to be attended by much greater effect upon the teeth than a change from warm to cold, and this, I think, is owing to the relaxing effect upon the general system, of such a change. Warm weather, with a very low barometer and a humid atmosphere, appear to be very productive of dental troubles.

Dr. Barker: I think we are too much in the habit of taking a superficial view of such a subject as this. Instead of the increase of dental complaints being attributable to the weather as the direct result of meteorological influences, I think that they are more the result of changes in the habits of the individual. During the summer season, large numbers of our

patients leave the city for the country. In doing this, they make an entire change in their habits, and a deleterious change; they eat what country people would not think of eating; they sit out at night under the trees upon the damp ground. All this tends to induce systemic disturbance, and that disturbance is as liable to affect the teeth as any other part of the system. I do not consider that changes of temperature, *per se*, have much to do with it. At the same time, I recognize the fact that a person in a weak and debilitated condition, is in such a condition, that almost any irritant—almost any departure from normality, will produce these results.

Dr. Harlan: I have myself noticed the preponderance of disease of the tooth pulp, and the frequency of abscesses during the heated term, and I have also noticed a fact which Dr. Barker loses sight of, viz: that such diseases attack people indiscriminately, and without regard to their general health. I believe that the lower classes of people, as a general rule, have about as good health as the upper classes, and that it is not on account of a low state of health that there is such a prevalence of dental diseases among them.

Dr. Flagg: The very reason why I urged the adoption of the suggestion which I made in regard to sections was, in order that we might, with the greater facility, get at correct statistics in regard to subjects of this kind. I have a tabulated experience of some fifteen years in regard to this matter of exposed pulps, alveolar abscesses, etc. According to those tables, I find that March has been, by three to one, the worst month I have had for alveolar abscesses, while in November I have had twice as many as in any other month except March. This year, to be sure, has been a very exceptional year. We have had an exceedingly troublesome winter—an antagonizing, devitalizing, enervating winter, and last March was a wonderful March for alveolar abscesses. In my practice in March last, they numbered hundreds. Now I have my tables in this direction, and I would like to have them either refuted or confirmed. The month of June past has been an exceedingly bad month, and I lost more pulps capped during that month than ever before. Such an increase I attribute to the fact of its being the Centennial year, and the influx of relatives and centennial visitors, which has compelled our citizens to remain at home during the heat of the summer and endure the enervating and relaxing influences of this exceptionally trying season in the city. The same marked increase in affections of the lungs—the marked increase in cases of general debility, which is observable in the spring, is equally noticable in diseases of the teeth. The teeth are almost the first organs to give evidence of a lowered condition of the system. When a man overworks himself, before he is aware of it otherwise, his teeth begin to give marked evidence of it. In a typhoid condition of the system, for instance

the teeth and hair are the first things to be affected. Patients think it is the medicine they take that has this effect, but it is not so. It is due to the disease, and not to the action of the medicines.

Dr. Rehwinkel: I am much gratified to see from the course of the discussion that we are beginning to be willing to acknowledge our failures. We are beginning to recognize that success in dental operations depends upon a variety of conditions outside of any special mode of operating. There is a great variety of outside influences which must be allowed to modify the treatment of a case in order to secure success, and these various conditions account for the difference in the views of men equally eminent, in reference to the treatment to be pursued in given cases. It is of no special importance what the teeth are filled with, provided the filling is adapted to the tooth structure and the surrounding influences,—the climatic conditions affecting the case. Persons get up here and tell us that they are in the habit of removing the nerve of a tooth, and filling it immediately. They may be able to do so in the locality in which they practice, while in other localities it may be utterly impossible.

Dr. Barker has alluded to individual habits as being more frequently than anything else a predisposing cause of dental disease. There is much truth in that, yet I contend that that statement does not apply with any greater force to the country than to the city. There is as much imprudence in the way of exposure, and as bad results from it in the city as in the country.

Dr. Barker: There are some statements which have been made here with which I cannot agree. I cannot, for instance, agree with the statement that when a man over-works, the first evidence of it will be in his teeth. That is something entirely opposed to good physiology and good pathology, and for this reason: it is a well-known law that the organ which responds first to over-work is that organ which is most highly organized—the brain.

There is no reason for taking typhoid fever as a sequence of decay of the teeth, and a low state of the system. Not a living man can look at a man and say "in one week's time you will have the typhoid fever," but as a sequence of disease and mal-nutrition, decay of the teeth results, and very justly, because the teeth being lower, respond to mal-nutrition and other debilitating influences.

Dr. Taft: I am happy to see this discussion taking so wide a range, embracing the whole range of pathology, and covering a field which we are not much accustomed to discuss. All that Prof. Stellwagen has said in reference to barometrical and thermometrical conditions is true in every

respect. It is certain that under a light or heavy atmospheric pressure, the system is modified. The air taken in in a rarified condition will necessarily produce a different effect from that taken in in a dense condition. In a rarified condition of the atmosphere, it requires much greater effort of respiration to get the same support from the atmosphere. Not only this, but a moist condition of the atmosphere has much to do with the condition of the system. This moist condition of the atmosphere is very easily understood. It loads the air taken into the lungs, and hinders the proper action of those organs. Then again it acts on the whole surface of the body, and arrests the exhalations from the surface, and the elimination of debris, which should be thrown off through the surface of the body, and so far as it has that effect of course it interferes with the functional actions of the system. The excessive heat which has been spoken of, sometimes rising to the point of blood heat, is very debilitating to the system, and in a way which I can hardly understand. There is another atmospheric element which has not been spoken of, which I am satisfied has a marked influence upon the system, viz.: the electrical condition of the atmosphere. The changes in this respect have been very frequent with us recently, and I know, both from experience and observation, that they exercise a great influence upon the animal economy. I have for four or five years had in my office an aquarium, in which I have kept fish, and in a number of instances I have had several of these fish die immediately after a thunder storm, owing, I presume, to the sudden change in the electrical condition of the atmosphere.

REPORT OF THE

COMMITTEE ON OPERATIVE DENTISTRY.

BY FRANK ABBOTT, CHAIRMAN.

Mr. President and Gentlemen of the American Dental association: This being the Centennial year of our national existence—this the city in which that existence was first proclaimed to the world, and this the Centennial year meeting of our association, it would seem right and proper that the progress which has been made during that period in "operative dentistry" should be noted at this time. Your committee has therefore concluded, that a report embracing the views expressed, and the practical ideas advanced, by the leading men in the profession, during that period, (or rather a faint outline of them), would be interesting and possibly instructive to some present.

In order that we might make our report extend back the requisite time it has been found necessary to make quotations from the writings of some outside of our own country. As at that remote period in our history ("a hundred years ago") there were no established dentists here, none at all events, whose ideas have come to us, either in print or in any other manner known to your committee. Our first quotation will therefore be made from the writing of the gentleman whom we have been taught to consider the father of modern dental surgery, whose works appear in the English language, viz.: John Hunter, F. R. S. His work entitled, "The Natural History of the Human Teeth," was published in London in the year 1778. Under the general heading of "Diseases of the Teeth," and the special heading of "The Decay of the Teeth arising from Rottenness," after giving his views as to causes and effects, he says: "I come now to the prevention and cure of this disease. The first thing to be considered is the cure of the decaying state of the tooth, or rather the means of preventing the farther pro-

gress of the decay; and more especially before it hath reached the cavity, whereby the tooth may be in some degree preserved; the consequent pain and inflammation commonly called tooth-ache avoided, and often the consequent abscesses, called gum boil. I believe, however, that no such means of absolute prevention are as yet known. The progress of the disease in some cases, appears to have been retarded by removing that part which is already decayed; but experience shows that there is but little dependence upon this practice. I have known cases where the black spot having been filed off, and scooped entirely out, the decay has stopped for many years. This practice is supposed to prevent at least any effect that the part already rotten may have upon the sounder parts. However, if this is all the good that arises from this practice, I believe in most cases it might as well be omitted. Even if it were an effectual practice, it could not be an universal one; for it is not always in the power of the operator to remove this decayed part, either on account of its situation, or on account of its having made too great a progress before it is discovered. When it is on the basis of a grinder, or on the posterior side of its neck, it can scarcely be reached. It becomes also impracticable when the disease is still allowed to go on, and the cavity becomes exposed, so that the patient is now liable to all the consequences already described, and the tooth is making haste towards a total decay; in such a case, if the decay be not too far advanced, that is, if it be not rendered useless simply as a tooth, I would advise that it be extracted, then immediately *boiled*, with a view to make it perfectly clean, and also destroy any life there may be in the tooth, and then that it be restored to the socket. This will prevent any farther decay of the tooth, as it is now dead, and not to be acted upon by any disease, but can only suffer chemically."

Again he says: "When there is no other symptoms except pain in the tooth, we have many modes of treatment recommended, which can only be temporary in their effects; these act by derivation, or stimulus applied to some other part of the body, thus to burn the ear by hot irons, has sometimes been successful practice, and has relieved the tooth-ache. Some stimulating medicine, as spirits of lavender, snuffed up into the nose, will often carry off the pain."

Under the heading of "Stopping of the Teeth," he says: "If the destruction of the life of the tooth, either by drawing and restoring it again, or by actual or potential cauteries, has not been effected, and only the cure of the inflammation has been attempted, another method of preventing inflammation is to be followed, which is to allow as little stimulus to take place as possible. The cavity of the tooth not being capable of taking this alarm like most other cavities in the body, and of course, not suppurating; often no more is necessary either to prevent the inflammation from taking place altogether, or extending farther than to exclude all extraneous irritating

matter; therefore the stopping up the cavity, becomes in many places, the means of preventing future attacks of the inflammation, and often retards even the progress of the disease, that is, the further decay of the teeth, so that many people go on for years thus afflicted; but it is a method which must be put in practice early, otherwise it cannot be continued long, for if the disease has done considerable damage to the inside of the tooth, so as to have weakened it much, the whole body of the tooth most probably will soon give way in mastication, therefore, under such circumstances, the patient must be cautioned not to make too free with his tooth in eating."

"Gold and lead (he says) are the metals generally made use of for stopping teeth. Gold being less pliable, must be used in the leaf. Lead is so soft in any form, as to take on any shape, by a very small force. Stuffing the hollow tooth with wax, galbanum, &c., can be but of very little service, as it is in most cases impossible to confine these substances, or preserve them from being soon worn away. However, they have their uses, as it is a practice which the patients themselves can safely put in execution."

"It often happens from neglect, and much oftener in spite of all the means that can be used, that the tooth becomes so hollow as to give way, whereby the passage becomes too large to keep in any of the above mentioned substances; however, in this case, it sometimes happens that a considerable part of the body of the tooth will still stand, and then a small hole may be drilled through this part, and after the cavity hath been well stopped, a small peg may be put into the hole, so as to keep in the lead, gold, &c.; but when this cannot be done, we may consider the broken tooth as entirely useless, or at least it will soon be so, and it is now open to attacks of inflammation, which the patient must either bear, or submit to have the tooth pulled out. If the first be chosen, and the repeated inflammations submitted to, a cure will be performed in time, by the stump becoming *totally dead.*"

It will be plainly seen from the foregoing quotations, what was known and being done by the great men in our specialty a century back, and their progress in practice was certainly slow, judging from the following, which I quote from the work of Joseph Fox, F. R. S., published in the year 1806. Under the heading of "Filing the Teeth," he says: "In those cases of caries, where filing has been recommended to retard its progress, the most decided advantages were promised, and it is a practice defensible on the most just principles. Caries is a disease which it is not in our power entirely to arrest by any remedy whatsoever; its progress is gradual, but certain, until the destruction of the tooth is effected. The only plan that promises success, is to remove the carious part from that which is sound, with the expectation that the disease will thereby be stopped."

Under the heading of "Stopping the Teeth," he says: "In stopping the

teeth, the first thing to be done is to clean the cavity from all extraneous matter, and to wipe it out dry; then a piece of gold or tin-foil leaf is to be introduced, and carefully and firmly pressed in, so as to completely fill up the cavity, so as to allow the mouth to be closed without pressing forcibly upon it. The stopping is then to be polished, and being quite smooth, it will not be in any way offensive to the tongue."

"A decay in the central part of the teeth is the most favorable situation for retaining the stopping; when it is in the sides, or between the teeth, the pressure of the food is liable to displace it, and therefore it requires frequent renewal."

Of instruments for stopping the teeth, he says, "They consist of a hook for picking extraneous substances out of the cavity; a straight and a curved instrument for pushing the stopping into the tooth, and an instrument with a bulbous-formed end, to be used as a burnisher in polishing the surface of the stopping."

How long, may I ask, would a modern dentist be satisfied with such an array of instruments for filling teeth?

The progress of operative dental surgery during the twenty-five years following, was very material: it was no longer a question whether teeth could be saved almost indefinitely: but how to accomplish it, was the all important question to be solved by nine-tenths of those daily performing operations upon the teeth. Dr. Smith had a method, Dr. Jones another, and Dr. Brown another, but they were quite sure to keep their methods to themselves, so that the rank and file were kept in ignorance of all the new and useful ideas these men of prolific brains were constantly coming in possession of. It is true they would occasionally write very learned articles, and "show great literary talents," but the truth was well spoken by Dr. Chapin A. Harris, when, in speaking of the writings of some of these gentlemen, he says, "it is unfortunate for the profession, and painful to him who expects to find in the works of these learned dentists, something which at least will instruct him." Fine literary productions were evidently considered of greater merit than good practical ideas. However, journals began to spring up, and associations were being formed, where practical information began, slowly, it is true, but steadily, to be diffused, for which we are indebted to Drs. Harris, Parmly, Townsend, and a very few others, of the most eminent dentists at that time, in this country. A general exclusiveness, however, was the order of the day, and continued to be so for many years. The operating room was a mysterious sort of place, where no one was allowed, except the operator and one other person, (the patient,) at a time. The door of that room was closed to all who exhibited any desire to pry into its mysteries.

This condition of things however, was not long to continue, as liberal-

minded men became engaged in the profession, who seemed to delight in telling all they knew, not only with their tongues, but with their fingers, thus giving to their brethren most valuable practical, instead of the vague ideas of the tongue or pen alone. In the year 1840, I believe it was, that the "Baltimore College of Dental Surgery" first commenced its labors. This opened to the dental student the first opportunity ever presented in this or any other country, for obtaining a systematic education in his chosen specialty. I might add, perhaps with a great deal of truth, that this was the real beginning of progress in dental surgery in this country. The door which had previously been closed, was now open for clinical instruction, (the only true method of teaching operative dental surgery). Since that time there have been started, at different periods, no less than thirteen schools devoted to the teaching of young men, their system of instruction based, in a great measure, upon their clinical facilities.

We do not wish to detract in the least, from what has been accomplished by individuals or societies in this great work of progress in our specialty. But we must claim for dental colleges the lion's share of credit for disseminating the progressive ideas advanced by individuals.

In the year 1855, Dr. Wm. H. Dwinelle published his famous article on sponge or crystal gold, in which he gave the process for restoring the contour of the teeth, and the restoration of the crowns of teeth with gold, a wonderful step in advance of anything which had hitherto been done in operative dentistry. For the want of proper instruments for the manipulation of these preparations, however, those gentlemen, or many of them, who tried them, were obliged to abandon their use for some years, until, in the year 1862 (I believe it was,) Dr. Wm. H. Atkinson gave to the profession, (simultaneously with the introduction by him of the use of the mallet,) the first set of pluggers which was in any way adapted to the use of either of these preparations of gold. Since that time quite a number of gentlemen have endeavored to distinguish themselves by having sets of pluggers made in accordance with their ideas of what was needed, and I believe each succeeding set presented in one direction or another, very material advantages over any former one.

In the introduction of the mallet, above spoken of, in my judgment, Dr. Atkinson took one of the longest steps in advance yet taken by any one. You all know how many sleepless hours it has saved you, and how very hard it would be to get along without it. We can all continue to do as we have done for the last fourteen years, every time we witness the results of the working of this "little joker," thank "the giver of all good and perfect gifts," for giving us, in our day and generation, the mallet for condensing gold. With this instrument we can restore the crown of a tooth with as much ease as we could fill an ordinary cavity formerly, but in order to do it

safely and satisfactorily, we must resort to the use of another most valuable invention, "the rubber dam." This invaluable idea was given to the profession in the year 1865, I believe, by Dr. S. C. Barnum. Previous to its introduction, however, the crowns of teeth were being restored very successfully by Drs. Arthur, Dwinelle and others, with the use of napkins only, not, however, without a great feeling of anxiety on the part of the operator, I imagine. When we were in possession of the "adhesive" qualities of gold, the mallet, and the rubber dam, we very naturally felt that we had reached the highest pinnacle possible to be reached in operative dentistry. In some respects we possibly had, for no better method for restoring the crowns of teeth has yet been introduced, nor is there any immediate prospect of any being introduced. Perhaps the one great fault of the American people is, that they are unable to ride any more than one *horse* at a time, consequently, when the beautiful "crystal gold" and "adhesive gold foil," with their wonderfully affectionate properties, were introduced, every dentist, or nearly every one, jumped from his soft foil to one of those hobbies, and attempted to ride to fame and wealth as by magic. Alas! for those who ride hobbies they are unacquainted with; disaster is quite sure to befall them. This did not prove an exception to the rule. With some, a few months were sufficient to convince them, that, for filling teeth, proper—not the restoration of the crowns of teeth—"crystal gold" and "adhesive gold foil," were "a delusion and a snare," for in many instances after teeth had been filled a few months, or perhaps a year, the patient would return, and very innocently ask what occasioned the discoloration about the fillings in their front teeth. I presume the most of you, gentlemen, know what kind of a sensation is felt by the dentist upon being interrogated in this manner, particularly if the patient shows his teeth at the same time. The question asked one's self would be,—"is that my fault?" "is it possible that those fillings were imperfectly made?" "I did that work as carefully and as thoroughly as any I ever did in my life"; "what can be the cause of it?" These and many other questions and soliloquies pass through the mind of the honest operator; facts are stubborn things, and here is one looking him in the face, saying as plainly as tongue can speak it, "these teeth are not being preserved from decay." What is to be done? What can be done? the fillings must be removed and the teeth refilled. If such a condition of things should occur in the mouth of but one patient, it might be easily accounted for, but having perhaps two or three a day for a month, refilling teeth becomes a little monotonous, and we begin to conclude that something else is at fault besides ourselves.

A little careful investigation shows us conclusively that we have attempted to ride a hobby that required some study, in order to learn how to manage, and not get thrown. Many a man, after making this discovery, quietly dismounts from his "Crystal Gold" or "Adhesive Gold Foil," and

as quietly resumes his old and familiar seat upon "Soft Foil," with which he fills teeth year after year and has no patients returning with teeth "turning black around the fillings." At the same time, he remembers with the kindest of feelings, the gentlemen who first discovered and made known to the profession the "cohesive properties" of gold, as he is constantly being called upon to restore the crowns of teeth, which he does in the most satisfactory manner, with the most cohesive quality he can obtain.

The next innovation presented to our notice was the "Dental Engine," which I believe came into market, (and went into the mouths of patients at about the same time), in the year 1870 or 1871. Here was an instrument, or perhaps I should say machine, which was calculated to do two things. 1st. To do the work of excavating cavities, and finishing fillings much more rapidly and perfectly than it could easily be done by hand. 2d. The pain usually attending the excavating is often very much less, on account of the rapidity with which it is done; there seeming to be produced, in some instances, a condition of anæsthesia; in every case the aggregate of pain is, I believe, less. These are some (not all) of the advantages the modern dental engine presents over the ordinary hand work in the mouth. Notwithstanding, it is undoubtedly in the hands of many, a dangerous instrument. The tongue may be cut, the cheek torn, and the pulps of teeth exposed, where, if the work was done without the engine, such things would not occur. The young and inexperienced practitioner should not attempt to excavate with it, until he has thoroughly learned to handle it, in trimming fillings, polishing teeth, etc. To prevent accidents in excavating with it, a thorough knowledge of the anatomy of the teeth is absolutely essential.

There has nothing of very special interest occurred in "Operative Dentistry," in this or any other country, which has come to the notice of your committee during the past year. The days of heavy and cohesive gold, I believe, are nearly over, for filling teeth. Gentlemen in the profession have settled down to a sober, practical solution of the questions of "what preparations of gold can I best preserve teeth with, and perform the operations in the shortest time and with the least inconvenience to my patient and myself?" These are practical and very important questions to every practitioner of dental surgery, and to the community at large. Why is it that so many good dentists are idle so much of their time, and others, probably no better operators, are always busy? To me the answer is simple. The one does not study the comfort of his patient in any thing he does, while the other makes that a special study in every thing he does. If he has one, two, or a dozen teeth to fill, he performs the operation as quickly as he possibly can, and do the work well. He has a regularly systematized plan for doing every thing he finds to do in the mouth. Each instrument is adapted to certain localities, is intended for parts of certain operations, and is seldom used for any other purpose. At the first glance he has of a tooth he is

about to fill, he comprehends the entire operation, and can select all the instruments with which to perform it before touching one to it. When he begins the operation he loses no time in selecting instruments; every move he makes, whether in excavating or plugging, is one ahead. He does not allow his operations to worry him; he never gets nervous, nor out of patience with his patient; but every thing moves along rapidly and smoothly. Time is saved to the patient, which, to many, is a great consideration. Their sufferings are very much less than when the operations are performed in a slow and tedious manner. All this pleases the people, and such operators are always, or nearly always, busy.

The man who has so much time on his hands, reverses every thing; he has no system about any thing; he seems, however, to try and see how long he can take to perform his operations; he will worry an hour, perhaps, to put the rubber dam on the teeth, when the operation might be performed and kept just as dry with a small napkin, in ten minutes. His instruments are scattered about in a promiscuous sort of manner. A certain lot of them are intended for preparing cavities, and another certain lot for filling; that is as much system as he can adopt. In preparing cavities, he will pick up instrument after instrument, only to find they are too large or too small, the blade curved the wrong way, or the curve is too much or too little; so that his time is wasted to the extent of from fifty to seventy-five per cent. At the close of the day he finds that he has accomplished very little—probably not one-quarter what the systematic operator has, and has sent away what few patients he has had, with any thing but pleasant feelings toward him.

In concluding, I will simply refer to the fact, that as practitioners of a specialty, of a great and wonderfully useful profession, the necessity for a more positive prophylactic treatment of the organs committed to our charge, is becoming more and more apparent to us all. I have become so thoroughly impressed with this idea, that in the case of every patient I am called upon to treat, I recommend something to prevent the teeth from decaying. In some cases it is a more thorough cleansing; in others, in addition to that, I prescribe an alkaline solution, for rinsing the mouth on retiring at night. And in cases where the teeth decay rapidly—either from lack of good organization, or the action of mineral acids taken in medicines—I have them rinse the mouth with it four or five times a day. The results of this treatment, in many cases, have been more than gratifying, in my hands.

The solution I prescribe is as follows:

Soda Bicarb,	drms ij
Ess. Wintergreen,	
" Peppermint,	aa oz. ss
" Aniseed,	
Cochineal,	grs. vi
Aqua	q. s., Oj

SUPPLEMENTARY REPORT

ON

OPERATIVE DENTISTRY.

By A. W. HARLAN, a member of the committee.

In presenting this report, it is proper for me to say that it is only intended to be supplementary to that of the chairman, and will not, therefore, be general in its character.

During the past year, few, if any, new discoveries or applications of old principles have been made in operative dentistry. The discussions on the amalgam question are going on the country over, and it seems probable that we are soon to have a solution of the question of its fitness as a material for filling teeth. The results of experiments made by the late Dr. Hitchcock and Prof's Bogue Cutler, and Chase, although presenting very clearly some things not definitely known before, are far from proving conclusively that amalgam is even the best of the baser filling materials now in use While I do not intend to discuss this question at all, I felt it incumbent on me to notice it thus briefly, so that the later investigations of Prof. Chase in this direction might come before you for consideration in their proper place.

Deeming it superfluous on my part to mention the new aids in instruments and machinery, of whatever nature, (that being the duty of the committee on instruments and appliances), I shall endeavor, as briefly as possible to fulfil, to the best of my ability, the duty assigned me.

The practitioners of dental surgery, prior to the discovery of the cohesive property of gold, however skillful in their manipulations or faithful in their endeavors to accomplish the desired end, were able to save but a tithe of the vast numbers of teeth coming to them for treatment. This, in great measure, was because of the insufficient means at hand to prevent the

encroachment of saliva ; another drawback was the non-adaptability of the form of gold used, for the great variety of cases needing treatment. A doubtful or dangerous case, if not doomed to be extracted, was then filled with an inferior material and consequently often lost in a short period of time. In fact, the conscientious operator often distrusted his ability to overcome the difficulties in the way of successful operations, on account of the possibility of his work being submerged by the fluids of the mouth. Others having no such fears, recklessly filled teeth with baser materials, regardless of their value as agents for the preservation of the teeth on account of the time saved in the performance of the operation. But a new incentive was given to the energetic dentist to excel in the style and variety of his operations, after the hitherto unsuspected cohesive property of gold had become generally known. It is true that the same, if not greater, difficulties, had to be overcome in protecting the fillings from moisture, but notwithstanding all hindrances, the ingenious operator saw at a glance that a wider field had been opened in which to exercise his talents, and vigorously commenced a new mode of practice—attempting often, in his enthusiasm, to accomplish something that should be perfectly dense and faultless in contour, without much thought of the tooth-structure he was operating upon. This, a wiser or more conservative head would not have attempted. Thus the path of progress was often obstructed, and the form of gold used was the most condemned.

With these prefatory remarks, we are brought to the subject matter of this paper. Incontestible evidence accumulates from month to month in our societies and periodicals, of a desire, on the part of many gentlemen prominent in the profession, to again resort to non-cohesive gold in filling teeth. The key-note of alarm was sounded by Mr. Thos. Fletcher a few years ago, when he stated that cohesive gold fillings were a failure, and could not, under any circumstances, be inserted so thoroughly as to prevent leakage around the margins. This was soon disproved, but the bare statement, unsupported by any evidence other than his own experiments, was accepted by many, who, having but an imperfect knowledge of the principles involved in the insertion of a cohesive gold filling, are ever ready to change, on the spur of the moment, if the slightest pretext is given them to do so. The timid but conscientious operator is ready, also, to discard as unreliable, a filling material the use of which has brought to him whatever of professional reputation he has attained to.

Having in mind the fact that a report should take cognizance of newer theories and facts in practice than are here alluded to, I have, nevertheless, felt justified in departing from the strict line of duty, recognizing the importance of any innovation, whether new or old, upon the present methods of operating. Some of the arguments advanced by the gentlemen agitating

the question of returning to a system of practice almost wholly discarded a quarter of a century ago, are:

1st. Saving of time in the performance of operations, and thereby lessening their cost to the patient. 2nd. A better preparation of the cavity. *3rd. More perfect adaptation to the margins of the cavity. 4th. Greater density of fillings, especially on the grinding surfaces. The above are the principal points of superiority claimed for non-cohesive over cohesive gold, as used at the present time.

In an attempt to evolve something of interest to you in discussing this question, I am conscious of the fact that it has been and must continue to be a subject of vital interest to dentists, even in the far distant future; for as I view it, until we have a more perfect system of prevention than is now known or practiced, we are compelled to rely on gold or something analageous to it for present use. Before attempting to point out the many advantages heretofore conceded to cohesive gold, I would like to ask why the dentist of twenty or thirty years ago, then fully aware of the various good qualities of non-cohesive gold, should have ceased using it so suddenly after a new but wholly untried property had been discovered, if it had answered all of the requirements of an universal filling material? I would like to ask further if it is not generally known that the art of mechanical dentistry had reached its highest point of perfection at about the period when cohesive gold came into general use? Is it not a fact also that the demand for artificial substitutes has decreased annually since that time, until at present we are seldom called upon to replace teeth which in those days were invariably lost? Is it not a fact also, that the teeth of our ancestors were of a better structure than are the teeth of the present generation? This is capable of demonstration by merely alluding to the system of filing then in vogue, the dentist often destroying their symmetrical appearance by making wide V-shaped separations and giving no further attention to them, while we consider it necessary to polish and repolish such surfaces time after time, to prevent the recurrence of caries. Was it because the practitioner of those days had less interest in saving teeth, and more in making substitutes; or because he was unable with the form of gold in use to make operations that should successfully withstand all agencies, whether mechanical, chemical or vital? Or because he felt that there was something lacking, and when it had been discovered, did he not desert the laboratory for the operating room; and has he not been faithful even to this day in trying to save what had formerly been lost? Now for this state of things I declare unhesitatingly that in my opinion we are indebted to Dr. Robert Arthur, the discoverer of the cohesive property of gold.

Without digressing further from the point at issue, the first question of

* *Vide* Missouri Dental Journal, April, 1876. "Cylinder fillings." C. W. Spalding, St. Louis, Mo.

saving time in the performance of operations shall receive attention. It is easy enough to dogmatically make an assertion if you are not expected to prove the truth of it, but to make an explicit answer to the above claim would require more time than is usually allotted to an essayist. Therefore, if *results* are not to be considered, I grant in part the justness of the claim, i. e., saving time in filling crown cavities; but when those are excluded from the list of operations performed with so much celerity, I pause and ask what class of cavities remaining in the mouth should, in justice to the patient, be filled with non-cohesive gold? It seems to me that there can be but one answer to the above question, when we take into account the fact that the day has come when the intelligent practitioner refuses to disfigure the teeth of his patient, so as to make an otherwise tedious or lengthy operation consume less time than should be spent, had he a regard for what is demanded of him. Practically, excepting a few small labial and proximal cavities, there is not in the mouth of a patient seeking our services, a cavity which, even though it might be filled with non-cohesive gold without serious disfigurement, should not be filled with the most cohesive gold attainable, on account of the strength required in such filling, to fulfil the object sought in placing it there. I deny without reservation the claim of saving time by using non-cohesive gold, because there can be no comparison in results, and that is what we are aiming at. With regard to lessening the cost of operations, I think that however desirable in theory, something like the following is a well known fact: where capacity, honesty and an inflexible determination to succeed, possess a man, his services are constantly increasing in value, without regard to the length of time required to perform an operation; therefore, that consideration carries little weight with it. As to the second claim—a better preparation of the cavity—I have this much to say: of the smaller cavities, the modes of preparation are essentially the same, but when the larger cavities, and those with frail walls are to be prepared, the methods of preparation for cohesive gold fillings are much superior to those for non-cohesive. Do you ask why? I answer that very often for esthetic reasons, we can spare the whole or a part of a frail anterior wall of enamel slightly supported by dentine, if we use cohesive gold, because we can build to, and over the margins, sufficiently thick layers of that form of gold, to thoroughly protect them in the event of their being cut away, while on the other hand, had an attempt been made to fill such cavities with non-cohesive gold, the walls would of necessity have to be sacrificed, the simple fact of wedging the gold into position being enough to fracture the margins of the cavity, unless they are cut away to a firm border, thus leaving wide and unsightly spaces. Now as to the third claim, "more perfect adaptation to the margins of the cavity," I deny at the outset the truthfulness of the above, for the following reasons. From my own observations during the past ten years, I am convinced that non-cohesive gold fillings on proximal surfaces, are much more liable to fail around the

margins than cohesive gold, because, as heretofore stated, the operators using non-cohesive gold—and they used to be legion—were afraid to cut enough to mar the appearance of a tooth, and the consequence was, a chipping of the margins, thus resulting in failure. Whenever they filled a crown cavity and left an overhanging border of enamel which seemed to be strong enough to withstand the force used in mastication, sooner or later, it was a complete failure, because the gold could not be packed underneath the margins so thoroughly as to support them, as was intended by the operator. Again, non-cohesive gold is very liable to flake around the margins of a cavity, unless a very great amount of force is used in condensing—greater by far than is necessary or desirable when using cohesive gold; the filling at those points will be porous, and of less use to the patient than a poorly condensed filling of cohesive gold. If any further proof of the position I have taken was wanting, I might say that the most pronounced advocates of non-cohesive gold confess that it is better to finish a filling with a few pellets or cylinders of cohesive gold, because they can obtain a denser surface, and one which will take on a better polish.* The fourth claim is, greater density of fillings, especially on the grinding surfaces. This claim of all others seems to me the weakest that could have been offered in support of any theory—for it is only a theory—when the truth or falsity of it is so easy of demonstration. The results of experiments reported to this association by Dr. George H. Cushing, at Detroit, in 1874, prove conclusively that the above is false in theory and in fact; but, granting that it were true, why is it, if such fillings are so superior in density, that we are often requested to examine the grinding surfaces of teeth for decay, when on so doing, instead of the expected new cavity, we find one of the "old-liners" of non-cohesive gold, so hollowed out by mastication, that it is no longer a protection to the cavity in which its remains are? Has any one ever seen such a state of things where cohesive gold was used in like cavities? It seems to me that the true solution of this question lies in the fact that in using a non-cohesive gold, it is impossible to make a perfectly dense filling. Assuming this to be true, when the force of mastication is brought to bear on the surface of such fillings, the interstitial spaces are filled up, causing a part of the hollowed appearance heretofore spoken of; the remainder resulting from the flakiness of the material itself; whereas on the other hand, had cohesive gold been used in such situations, the filling would have been one coherent mass, perfect in its adaptation to every part of the cavity, and doing service without apparent wear, even though it were not perfectly dense.

Now, while I am willing to accord to those giant intellects of the past great honor for what they did in their day and generation for the upbuilding of the science of operative dentistry, I am not willing to accept the

* *Vide* Missouri Dental Journal, April, 1876. "Cylinder fillings."

heritage left us and use it in modern dental practice; for the reason that something more is demanded of us. As was remarked before, the teeth of the present generation are far inferior in structure to those operated on in the past. This fact alone makes it imperatively necessary that in our operations we should as thoroughly as possible protect all surfaces of dentine and enamel, where the nature of the decay demands it. This we are unable to accomplish with non-cohesive gold. Again, I contend that in the successful use of cohesive gold, the development of the highest grade of skill is attained, the nature of that form of gold itself compelling the operator to proceed step by step until every part of the filling is completed. Instead of being a hindrance, this is a positive benefit, as it enables the operator to put to the best possible use whatever of artistic ability he may possess. Then the result attained is far superior to that by any other method. This is unquestionably true; for be it remembered, in the one case we have a perfectly coherent mass, and in the other the particles are only in apposition, and it matters not how well they were placed in position, no dependence can be placed on the strength of the filling itself; but on the contrary, the walls and margins have to sustain all of the varied requirements of mastication. We can go a little further, and say that it is folly to suppose that we must make all of our fillings thoroughly dense, for that is not needed in all cases, but that it is more desirable to make them from a form of gold which possesses the element of cohesiveness, I am firmly convinced.

In conclusion, gentlemen, understand me, I am not here as a special pleader for that most absurd of all hobbies, the perfect contouring of teeth, but I plead for that wise conservatism, which, in its fullest understanding, demands of him who practices it the perfection of good judgment.

Replanting and Transplanting Teeth.

By W. N. MORRISON.

I wish to present at this time only a few of the more interesting cases. I will preface this report by saying that all the cases reported by me to this body last year are firm in their places and doing good service, with one exception—No. 2.

Dr. Ingersoll's tooth is a failure. It was doing good service until sometime in March of this year, when he was eating some pitted cherries, and gave the tooth an unlucky jar on a stray pit. The tooth, having a large crown and a small and broken root, began to get loose, and, when I saw it last it was in a hopeless condition.

No. 41. A young lady, aged about twenty years. Left superior bicuspid, large decay in distal surface, involving pulp canal. The tooth had given trouble ever since it had been filled, at nearly every change in the weather. Having a desire to see the apex of the root, I extracted the tooth. In refilling it, the buccal wall, which was very thin, broke off, so it was finished up as a cuspid, and in replacing it in the socket, I turned the palatine wall to the buccal side of the socket.

No. 48. Wife of a prominent physician; right lower second molar; small decay on distal surface, very inconvenient of access, being under the gum, and the crown of the third molar dipping into it. First molar missing. The patient, being in a prostrated nervous condition, begged to be let off easy, so I compromised my professional dignity (or according to some, elevated it,) by filling the tooth with amalgam. Everything seemed lovely, but at the end of about the third day she came to have it extracted, which was accordingly done. Next morning she returned and had a small filling put in the mesial surface of third molar, and in the meantime the extracted tooth (whose dead pulp was the cause of all she trouble) which had been filled, roots and crown, was returned to the jaw.

No. 40. Miss Mc——, aged about twenty-two years, nervous tempera-

ment, an abundance of dark hair, dark eyes, medium height, had a right lower third molar, which had required the dentist's services from the time of its eruption. There was a large corono-buccal cavity, extending deep under the gum, which I had filled about a year previous with oxychloride; root canals at the same time. In biting some hard substance the entire remainder of the crown had given way, leaving nothing to work upon. The patient has a younger sister with a splendid set of teeth, but scarcely enough room for her third molars, so I requested her to bring this sister at her next visit and I would transplant one of her teeth to the patient's mouth. They came, and with a great deal of difficulty the roots of the broken tooth were removed—two distinct roots; the sound tooth was extracted from the sister's mouth; root vessels removed and canals filled; but as this tooth had but one large tapering root, I had to remove the septum of bone and prepare a socket for it. The tooth was transplanted to patient's jaw and the articulation was good. The patient had all manner of fears and sensations to ascribe to it for a few days, but it improved rapidly, and to-day is a splendid masticator, doing good service. Of course there was no fear of blood-poison in this case, but I have a number of cases which I am keeping filled temporarily, hoping that something may turn up by which I can get teeth to suit the cases, with little or no risk from blood-poison.

No. 56. Left lower third molar for a man about forty-five years of age; florid complexion. It had been filled with gold for years, but the cavity being shallow on one side, the filling gave way, and the tooth became sensitive to mastication, and he had an annoying ache for weeks. My first treatment was to excavate the margins of the cavity and fill with oxychloride. For several days there was an improvement, but the patient came gradually to the conclusion that he would rather be without the tooth than have the ache. Being quite positive that there was a deposit of calcific matter in the pulp, I could promise no relief without a destruction of the pulp, which in cases of this kind, gives more pain than the extraction could possibly do. The tooth was extracted and root vessels removed, when sure enough a nodule of calcific matter was found there. Roots and crown were filled, and the tooth returned to the socket. Unfortunately, I had made too much restoration to the crown, and the other teeth could not come together. It gave the patient a great deal of pain and me much trouble to get it ground down, owing to the peculiar slanting articulation with the upper ones. This was finally accomplished, and at last accounts the tooth was quite comfortable.

No. 57. A healthy young man aged about twenty years, presented himself with first and second left lower molars badly decayed; pulps dead; face much swollen and hard, and had been thus for three days. There had been similar swellings from them before. These teeth were extracted on the 21st of June, about seven o'clock p. m., and returned to their places the

22d, about nine o'clock p. m., having been out about twenty-six hours. I saw the patient on the 22d of July, and everything was in splendid shape.

There were several cases where calcification of the pulp was prognosticated, and I regard it as the least painful and most satisfactory way to treat such cases. Cases 56 and 31 were reported on page 105 March number *Missouri Journal*. I have a great many other cases of interest, but not believing in long papers, I close, thanking you for your indulgence.

DISCUSSIONS.

Dr. Jas. Leslie: I would like to make a few remarks upon the subject of the papers of Drs. Abbott and Harlan.

I desire to state that I was the first person to introduce what is known as cohesive gold to the dental profession. I discovered this peculiar property of gold in 1839. While on a visit to Louisville, Kentucky, I called the attention of Dr. H. A. Gould to it, who made a practical application of it, and succeeded in building up some very fine contour fillings. There are some individuals who do not appear to recognize the peculiar nature of gold foil. They have an idea that the harder they make the filling the denser it will be. The more you beat upon gold foil, no matter how soft it is, the harder it will become. The same force that destroys the character of gold when it is placed on an anvil, is the force which is applied in excessive malleting. It is scientifically and chemically established that just in proportion as you hammer gold, just in that proportion will it become hard. The result is weakness throughout the whole mass, and a liability to disintegration. If you take two pellets of gold and condense one thoroughly inside the tooth cavity, and then condense another to an equal degree outside, you can not bring the two into cohesion in the cavity, and for the reason that you have malleted the electric life out of the two pieces before bringing them together. If you take several leaves of gold, as they come from the gold beater, put them together and condense them, you will find that you have not extended the mass in the least. All you have done is to eliminate the air contained in the mass—merely driven the air from the interstices of the pellet. When you have done that, brought the points of gold thoroughly in contact with a certain degree of condensation, you have done all you can do to make gold solid or hard. Any malleting beyond that

tends to injure your filling. In regard to the shape of the instrument, I do not think it is necessary to use such small-pointed instruments as are generally used. Why, a blacksmith would smile at you if you told him he ought to use a small-headed instrument in welding a piece of iron. The larger the instrument he can conveniently use, the better.

DR. WETHERBEE: I would like to ask the gentleman how he reduces cohesive foil to con-cohesive foil?

DR. LESLIE: If you go into the market to-day and get me the three kinds of foil in use—cohesive foil, semi-cohesive foil, and non-cohesive foil—I will take them and put them through such a manipulation as will utterly destroy their identity, so that not one man present can tell which is the cohesive and which is the non-cohesive foil. If you take a piece of cohesive foil and put it in your drawer for several nights, upon taking it out it will be found soft, owing to the carbonic acid gas which has settled upon the surface during the night.

DR. KINGSBURY: I subscribe fully to almost all that Dr. Leslie has said. I think, however, that cohesive gold can not be as readily and perfectly adapted to the walls of a tooth cavity as non-cohesive gold. It is less ductile and pliable, and there is necessarily more rigidity about it. It has been claimed by some that gold must be chemically pure, in order to possess cohesive properties. That is not the case. I have in my possession to-day a quantity of foil made for me as much as fifteen years ago, containing a certain percentage of silver, which is as cohesive as any gold you ever saw, showing that the cohesiveness of gold is no indication of its purity. Prof. Leslie has told us how cohesive gold can be made non-cohesive, and how chemically pure non-cohesive gold can be made cohesive. I don't know as it is known to the profession generally that Abbey's non-cohesive gold foil possesses a property which no other gold foil does possess, viz: the quality of retaining its non-cohesive property under all circumstances.

DR. BARKER: It was stated to me by one of the most eminent chemists in this country, in speaking to him on the subject of gold foil, that if you take two pieces of gold leaf and place them one upon the other, so that they could be subjected to a gradual pressure of a million tons, without any shock, when the pressure was removed they would be just as separate and distinct as before.

He stated that a shock was necessary to overcome filmal resistance, while Dr. Leslie, as I understand him, states that it is not. I think, however, that we can over-mallet just as much as we can over-drink, or over-smoke.

Dr. Wetherbee: I desire first to correct, if possible, what I esteem a very erroneous theory, viz.: the calling cohesive gold hard gold. It is the softest possible condition of gold. It has obtained this character for hardness simply because, in manipulating it, one particle clings to another.

There is another point: Mr. Leslie could not understand why cohesive foil could not be as readily adapted to the walls of a cavity as soft foil. He did not think it could. Now I take issue with every man of that opinion, and I claim here, now and forever, that cohesive foil can be as readily, effectually and thoroughly adapted to the walls of any and all cavities, as any other foil. Of course it is requisite to know where to commence your filling, and how to conduct the process of filling, in order that one portion of gold shall not impinge upon another, and therefore prevent the carrying home of gold to particular points.

I make a third point: That the cervical wall of any and all cavities where the rubber dam can be used, can be as effectually and thoroughly filled with cohesive foil as with non-cohesive foil. But it is claimed that cervical wall cavities are generally the first to give out. That is true, but it is not because of the cohesive foil filling. It may depend on two causes; the filling may recede from the wall in the course of the operation, in the slightest possible degree from that point, which is sufficient to cause a failure. Then, again, by too severe malleting you are very liable to abuse the dentine, a fact which has been overlooked by hundreds of dentists. Cohesive foil does not require a great amount of malleting.

Again, it is claimed that undercuts cannot be well filled with cohesive foil. That is not so. Undercuts can be filled with cohesive foil if you have the proper instruments, handled with proper skill. I have no trouble except in a certain class of cases where the teeth are very poor.

I defy any man in this audience to demonstrate to me that soft gold is more adaptable to the walls of the cavity than cohesive foil.

Dr. Shepard, Boston: I will accept the gentleman's challenge. I desire, also, to answer the question put by Mr. Leslie, in regard to why it is that non-cohesive foil can be more easily and perfectly adapted to the wall of a cavity than cohesive gold. Cohesion is a property possessed by the atoms of matter of uniting with each other when brought within immeasurable distances of each other. When you bring a molecule or atom of one material in such approximation to another different material, you get a union which is called adhesion—sticking to; cohesion—sticking together. When we bring together two surfaces of cohesive foil, which is a pure foil and a clean foil, there is nothing between those surfaces to prevent their union when they are brought near enough together to constitute what is called contact. The non-cohesive foil has something on its surface which presents a barrier to contact, or the union of the two molecules.

When a sheet of foil is taken on a napkin and rolled into a rope, we have a wrinkled condition of the surfaces, so that these surfaces touch at irregular points through the whole mass. If this gold is non-cohesive, these points of apparent contact are not brought into such an approximation as to enable cohesive attraction to be set up between them, and hence there is no cohesion, but the surfaces are free to move or slide one upon the other. The rope is still pliable or "soft," as some prefer to call it. This softness will remain whatever style of force we use in the manipulation, and hence its facility of adaptation to uneven surfaces during the process of consolidation.

If, on the other hand, our rope is made of freshly annealed foil, or made as above, of non-cohesive or "stale" foil (as the English call it,) and then annealed, what do we get? The barrier, whatever it is, to perfect contact is removed, union—cohesion, takes place between every one of these touching points, and there is produced throughout the entire mass, pillars, columns and arches of every size and shape, making a structure which embraces the foundation principle of architectural strength. Our pliable rope is now stiff and rigid or "hard," if you like the term, not because the gold is made any less soft by annealing, but because we have to overcome the strongest principle in nature, the arch, and break it down. To do this, if the mass is large and so there are a series of arches on arches, we must employ great force, or like the blacksmith spoken of, a large hammer and an anvil, or in other words be gold-beaters. With lighter force we get a breaking down of the arches on the upper surface and to a less extent on the lower, but we have the arched condition remaining in the center, surface consolidation or case-hardening utterly destroying that beautiful facility of adaptation which non-cohesive gold, even in large masses possesses, and also the power of welding this mass to another in the cavity. This is the philosophy of the bosh of "malleting out the electric life," and to me seems an all-sufficient explanation of what some have considered a mysterious quality of gold.

I wish we could banish the terms "hard" and "soft" gold. There are only two terms—cohesive and non-cohesive. The former is the softest gold in the world, provided you do not form it into arches and curves; the latter is always soft simply because the points of contact do not cohere in making it into a rope, a pellet, or in working it.

The practical inference is, that if we use cohesive foil, and want to carry it thoroughly against the walls of the cavity, we should use it in small masses, so that we have the minimum of these arches or curves, or use it in flat folded ribbons or use high numbers. Also if we would use large masses, let it be of the non-cohesive variety.

Dr. Flagg: With the exception of very large countour fillings in certain cases, I use generally gold foil both soft and hard, as it has been

termed. This distinction, however, is incorrect. I fill my crown cavities, as a rule, with non-cohesive foil, and I do it because my experience assures me that this is the best material for such cases. I have seen fillings of that kind which have stood unimpaired for fifteen or twenty years. Where fillings on articulating surfaces can be put in in a short space of time, and do just as good service by using soft foil, I see no reason why it should not be used.

In proximal cavities—cavities where the walls are very thin and will not bear a great amount of malleting—in such cases I use cohesive foil. By gently carrying my foil into place layer after layer, (not using heavy foil,) I can make excellent fillings in such cavities.

Dr. Morgan: I thought that the paper of my friend Abbott was somewhat inconsistent. Dr. Abbott says that, so far as he is concerned, cohesive gold is an entire failure, but when he comes to speak of the subject of contour fillings, he is enthusiastic in regard to its merits. It seems to me that that is a fatal inconsistency—a turning square about.

I will here answer my friend Kingsbury as to how non-cohesive gold may be made cohesive: simply make the surface of your gold clean and soft, and it will be cohesive. I think my friend Shepherd demonstrated that one ought never to roll cohesive foil into a rope, and ought never to use it in pellets; that it should be folded, put in in a laminated shape, so as to avoid the making of those arches.

One word in regard to the original introduction of cohesive gold. Mr. Tomes, in 1842 or '43, in a lecture before the Middlesex hospital, stated that some gentleman had recently returned from the United States and brought with him an article of cohesive gold. That was in the form of a precipitate, and he and others had attempted to use it, but with no great success. I think if you examine the old *American Journal* as early as 1845 or '46, you will find that there was at that time efforts being made in Europe to use cohesive gold. Lately, in an article on the use of gold, which I prepared for the Tennessee Dental Association, and which was the result of considerable research, I stated that no new principle has been discovered in connection with gold for the last fifty or perhaps one hundred years.

Dr. Stellwagen: It seems that with a regularity as perfect as the movement of the planets, we come around periodically to a discussion of this mooted question of the relative merits of cohesive and non-cohesive gold. One year the balance of opinion is in favor of cohesive foil. The next year it will change, and non-cohesive foil will be in the ascendency! Now, what does this fluctuation of opinion signify? It unquestionably means that a good, serviceable filling can be made with either of these materials. It means that under certain conditions one is superior to the other.

Since 1859 I have used Abbey's foil, and I corroborate what Dr. Kingsbury says: that Abbey's non-cohesive foil cannot be made cohesive. I have found this foil to be entirely uniform. In all my experience with it I have never found but one or two leaves that were not susceptible of manipulation, and therefore its use is attended with less waste than almost any other material. The less change we make in foils, I think, the better, because in handling a certain foil we come to understand its qualities better and better, so that each filling with the same foil is an improvement on the one before. Now, in regard to using cohesive foil—one method of using it might be illustrated by the manner in which a car wheel is put upon the axle. It is put on, I believe, by hydraulic force, driving the axle into the wheel, and the greater the pressure required, the more exactly will the axle fit the car wheel. Now, there are two ways of filling a cavity with cohesive gold—welding it piece to piece, and also by putting it in in one plug, each being preferable to the other in certain cases. We are to exercise our judgment in the choice of materials and methods, and the right exercise of such judgment constitutes one of the chief elements of success in dentistry. Why, if there were but one inevitable way of operating—no scope for the exercise of skill and judgment—a Chinaman might be employed to perform dental operations.

Dr. Hunt: I trust I may be pardoned for uttering a slight criticism upon the discussions of this body. That criticism is that we make assertions without giving the reasons for them, or producing statistics to prove our statements. The first paper read spoke in quite disparaging terms of cohesive gold as a filling. The second paper took the opposite ground, and instanced fillings in the grinding surfaces of molar teeth which had proved signal failures. But this proves nothing. We can all of us call to mind fillings of that class which have stood the severest tests. I think it is established by any number of cases that perfectly successful fillings are and can be made with either kind of gold; but in using these different kinds of gold their different conditions must be understood, and the manipulations studiously adapted to those conditions.

It is an undisputed fact that there is no effect without a cause. It is an equally undisputed fact that a cause will always be followed by an effect. Further, every process from every cause to its appropriate effect must take place in accordance with certain unvarying natural laws. If we lose sight of this foundation of science and philosophy in our investigations, we must go astray just to that extent. Now, how many are there who understand precisely what will be the behavior of gold in its different forms and conditions? I must confess that I do not know. We will take a cavity, for instance, and introduce into it a non-cohesive filling. We will then take another, and introduce into that a cohesive filling. Then after the gold

has been condensed in each of these cavities to the extent, we will say, suggested by Mr. Leslie, let us apply a hammer smartly. What is the behavior of the gold in the cavities respectively? We all know that by hydraulic pressure water can be made to burst the strongest iron vessel. I know if you take a cast iron cup and pour it full of lead, and take a moderate sized hammer and hammer upon the surface of that lead, you will eventually break that cast iron cup. Now, to what extent does this law apply to the action of gold in a tooth cavity? It is the object of this association to investigate these principles—all the principles which underlie the practice of our profession. Can we do this by simply making assertions? It should be our aim to investigate subjects in a spirit of scientific inquiry, thoroughly, searchingly; not presenting our conclusions until we have considered every element in the question. We cannot, in our profession, restore destroyed tooth-structure. We can replace it with a more indestructible material, and we can also, by following this process of investigation, not only do this, but we can go further back and remove the cause. We have heard fact after fact stated here, and much that has been stated has been neutralized by direct counter statements. This indicates something radically wrong in the methods of investigation of this association, as a body organized for the promotion of dental science.

In our part of the country we are deeply impressed with the necessity of conservatism in dentistry—conservatism in investigation and conservatism in the practice of dentistry.

Prof. Barker: In regard to this subject of cohesive and non-cohesive gold, I desire to say that I have made some very careful microscopical examinations of sections of fillings of both cohesive and non-cohesive gold after thorough packing, and I have not been able to detect the slightest difference in density.

In regard to the subject of replanting and transplanting teeth, I admit that it may be done, but it is an operation attended with no small risk. I have seen a case where a patient had seven teeth extracted and re-inserted, as a last resort in the management of disease—seen them taken out on account of spicula of the bone, and that too of a character found only in marked gouty diathesis, with uric acid crystals standing out on the roots. I have seen them taken out in such a case, replanted with every precaution, and after a long time become firm and solid in their sockets. Then I have seen one more extracted, and seen tetanus supervene under unfavorable thermal and constitutional conditions. Few here know by actual observation what tetanus is; but he who has once seen it would perform no operation involving a risk, however slight, of inducing such an attack. He would take no risk of septic poisoning in order to preserve an organ which we can preserve by other means just as well. It is true the operation may

be performed successfully, but I consider its indiscriminate practice ill-advised. In the operation of tortion also, you are very liable to injure the alveolar process, and the injured portion may go on to degeneration, so that you have septic poisoning, tetanus, erysipelas and death.

There is another thing which I wish to bring to your attention. That is the elongation of a front tooth when broken off, instead of restoring with gold. Suppose it is a child who presents itself with a broken central incisor. I first smooth the posterior surface. Then I throw a ligature around the central incisor, and also a ligature or two ligatures, if you please, around this broken central. Now to those two ligatures upon the central incisor upon its proximal surface I tie two little thin rubber bands, which should be of a very delicate and flexible character, as what you want to obtain is a gradual pressure—extensile force. In this way the tooth is gradually elongated and brought out of its socket, down upon a perfect line with the others. Now then, as soon as this takes place, I take the burring engine and very carefully burr off the point of the tooth to a regular line.

Dr. McDonnell: It has been remarked that there was more in the man behind the instrument than there was in the instrument or the material. In my opinion this is not entirely true. I think there is as much in the gold and the instrument used as there is in the man. There is as much in the choice of right materials as in anything else. Many an unfortunate failure has been the result of an attempt to fill teeth with gold, which were not amenable to preservation by such means. Dentists have heretofore, as a rule, been unwilling to recognize any other material than gold as a filling for teeth, but I hazard the statement, and I think I can back it up, that the most inexperienced empiric you can pick up, carrying around his box, can, under certain circumstances, fill a tooth with amalgam, so that it will last longer than the same tooth filled by the best operator you can find in the profession. Under certain circumstances I consider gold the worst material I can use in filling teeth.

I agree with Dr. Leslie in the statement that gold is destroyed by too hard malleting. I go further, and say that there have been more teeth destroyed by heavy malleting, than there have been gold plugs so destroyed. I have used the mallet, but not so extensively and severely as some have done. There are many teeth—teeth of a chalky composition and inaccessible in the mouth—which cannot be saved by the present dental skill, by the use of gold. In such cases it would save the patient much expense and suffering if the dentist would introduce, instead of gold, a good amalgam filling.

It should furthermore be the dentist's duty to give patients such instructions as to the care of their teeth as will prevent the recurrence of decay. He should furnish them with brushes, and impress upon their minds the necessity of using them regularly.

Frequently when fillings have been well inserted in the buccal surfaces of teeth, an examination afterward shows a deposit of decomposing food there, and as a result of such uncleanliness, a dissolving away of the enamel of the tooth at that point.

Dr. Barker: I want to make a few remarks in modification or explanation of some remarks I made this morning, upon the subject of the transplantation and replantation of teeth. I recognize the great difference between replantation and transplantation. Transplantation I consider under all circumstances reprehensible. Replantation is admissable and advisable under certain circumstances, in my judgment. I do not disapprove of the replantation of teeth, after accidents, for instance. I would go further, and say that sometimes in a morbid condition, extraction and replantation is advisable; always, however, recognizing the necessity of making an opening for the drainage of fluids, which otherwise may cause septic poisoning. Unless there is proper drainage, the operation is attended with danger.

Passing from that point, I desire to call attention to this matter of elongation of teeth—drawing out broken teeth so as to make them as long as their neighbors, and that, too, without destruction of the pulp. It requires for this operation considerable time, and the force applied should be exceedingly gradual. For the purpose of showing you how exceedingly careful I am, I have brought a sample of the very delicate tubing that I use—the finest French tubing. I give you here an entire diagram: A young student at the college presented himself with a supernumerary tooth, situated as many are, between the central incisors, giving an unpleasant aspect to his mouth. While it was possible for me to have built gold on that tooth upon each side, and transformed this canine in its appearance into a central incisor, yet by placing these rings as I tell you here, and gradually elongating the tooth, I drew it from its socket until I could take off its point, and get consolidation. But there is another point which I want you to recognize, and that is this: when this has been accomplished—when the tooth has been elongated—it rests entirely with the operator whether or not it will be successful. Everybody who is at all acquainted with the physiological conditions of plasma in different stages of organization, knows with what ease that plasma is absorbed. Now, it becomes necessary after a tooth has been brought down, that the motion of the tooth in its socket should be prevented. This may be effected by a delicate plate, so adjusted as to hold the tooth in its position, at the same time not preventing the normal motion of the tooth in the socket, or you may have an absorption of this, and a gradual passage of the tooth back into its old position.

There is another means by which this can be made use of and the same thing accomplished, only in a different manner, and from an entirely different pathological condition. For instance, when a tooth, instead of being

shorter, is considerably longer than its neighbor, you can apply force directly to that tooth, and push it back into its socket. I do not care if it is five or ten years after it has been in an abnormal condition. This is taking broad ground, but it can be supported by facts and good physiological explanations. You have to do the same thing that was done when the tooth was brought down. You have to be careful that consolidation takes place thoroughly before you give up the case. In other words, the tooth must be so arranged as to prevent motion in the socket until consolidation occurs. It may be remarked here that the ligature around the tooth, which serves as an attachment, may cause an elongation of that tooth also. There is, it is true, some danger both of elongation and irritation. I rely upon a ligature placed around the neck of the tooth, and I have a tube, which I will show you here, which I can place upon a tooth so that it will not cause irritation.

Dr. Stellwagen: Dr. Barker states, as I understand him, that transplantation is never justifiable. I have a patient here which demonstrates the contrary. [The Dr. here produced a cock, with a tooth growing in its crown]. The history of our patient is as follows: Three weeks ago to-morrow a little patient came to my office for whom I found it necessary to extract a bicuspid tooth. The tooth was extracted at nine o'clock in the morning. I placed it in water, and allowed it to remain until one o'clock, when I purchased the bird which I here produce. In this connection I wish to say that there is unquestionably danger in the performance of any operation, from pathological changes. I believe that in the insertion of a gold filling, particularly when it comes down close to a pulp, there is danger of tetanus. I am well satisfied that there is danger of tetanus in capping pulps. Dr. Barker cites a case of replantation which I have always taken the ground was a justifiable case on his part. The patient in this particular instance, where he had been successful so many times before, had by a long course of fastings and religious observances, placed herself in a very abnormal pathological condition. There was a pathological condition at the ends of the roots of these teeth which was peculiar, and which in itself was sufficient, without extraction and replantation, to have produced this disease. Of course, if we confine ourselves to the lower grade of operations, we may never have any such necessity as the Doctor speaks of, but I hold that this operation is just as justifiable—far more justifiable than many surgical operations which I have seen performed before dental associations. It is justifiable because it will at times replace teeth which are invaluable to the possessor. The loss of a front tooth may seriously interfere with proper articulation—may impair one of the most important functions of the body. We continually hear of cases where ten times as severe and dangerous operations are performed, simply for the sake of appearance—not for the sake of utility. In any case where I felt that the loss of a tooth would interfere with articulate speech, I should esteem it my duty as a practitioner to replace that tooth in some way.

Dr. Brockway: I would like to ask the gentleman what his experience is as to the permanence of such operations? It seems to be assumed that this operation of transplantation is a permanent operation. That is contrary to my experience and observation.

Dr. Stellwagen: My experience as to replantation is of course necessarily limited to a certain number of cases. In the Odontographic Society we had presented a tooth which had been extracted and replanted, which remained in the mouth somewhere between eighteen and twenty years. I transplanted a tooth some time ago which, the last time I saw it, seemed to be doing very satisfactory service. My experience in replantation has been uniformly successful. About the third day I usually find the soreness has passed away. The teeth I have replanted most frequently, have been the dentes sapientiæ, which, on account of the overhanging mucous membrane and gum, it was impossible to fill in consequence of the bleeding. In such cases I have frequently made replantations with perfect success, the teeth being just as serviceable for masticatory purposes as any teeth, and much more perfect than they otherwise would have been, as regards filling. Another case of transplantation was that of a bicuspid, which was crowded out of the arch of the jaw in such a manner that to have forced it into its proper position would have required a tedious and painful operation. It was extracted, and the root of a similar tooth from the mother's mouth put into the daughter's mouth, and the tooth of the daughter put into the mother's mouth. In this case, the subjects being of the same blood, of course there was no danger of the transmission of any hereditary disease, which, it is unnecessary to state, it is possible to transmit by this operation. It is an operation, of course, which demands caution on the part of the dentist; but it is not, on that account, objectionable. I have in mind now three cases reported, where transplantation resulted in symptoms of secondary syphilis. Those were cases performed some time ago, and it is probable that they were performed by men not competent to judge of the person's condition from whom the teeth were taken.

Dr. Ambler: We have had various revolutions in dentistry since I began its practice, and I have found it interesting to mark the changes of opinion which have taken place. In regard to hard and soft foil, I heartily indorse what Prof. Shepard said this morning in regard to the difference between them, and the difference which should be observed in their use.

As to transplanting teeth, I desire to corroborate what has been said in regard to the permanency of the operation. At the time the American Dental Convention met in Boston—some four years since—a young man was brought into the meeting who had had a tooth transplanted. This operation was performed under very unfavorable circumstances. The operator

stated that he had taken the tooth to supply the place of this lateral, from some old teeth he happened to have, and which, being decayed, he filled with gold. Upon trying to insert the tooth in the socket he found it too large, and he accordingly dressed it down and forced it into the socket. At the time we saw it, it had been in wear three years, was perfectly firm in its socket, and exhibited no indication of inflammation at all.

I have myself, in two or three instances, experimented in that line, but not to my entire satisfaction.

I have under treatment a case where the left central incisor was out of place, the apex of the root overlapping the lateral, and the lateral forced out of its position, so that there was comparatively little space between the canine and that tooth. By the use of ligatures, I changed the direction of this root from this angle to a horizontal, moving it back fully a quarter of an inch. I was over nine months in completing this operation, but the result was entirely satisfactory, and this tooth is now perfectly regular in its position.

DR. TAFT: This subject of resetting or replanting teeth is to me a very interesting one. If it amounts to the retention in the mouth of a tooth which could not by any other means be retained, it is a very important and valuable operation.

This operation, moreover, teaches us a great lesson as to the power of nature in the direction of reparation and recuperation. There are circumstances, it seems to me, where the operation may be employed to advantage. At any rate, on two or three occasions, I have resorted to it with what I regard very decided advantage. For instance, I have sometimes found a chronic inflammation—a thickening of the tissue around the teeth—a condition making the tooth of little value, so far as mastication is concerned. I have in some instances taken out these teeth, removed the thickened tissue from the root and replaced the tooth again. In such cases I have almost always succeeded in restoring the tooth to perfect usefulness. I have more frequently employed this operation in the treatment of alveolar abscess, and I regard it as a prompt and efficient method of treatment of that disease, especially those obstinate cases which present a marked degree of resistance to treatment.

This operation is more practicable, of course, with teeth of a single root, than with those having more; but it can be done with teeth of two or even three roots, where the divergence or curvature of the roots is of such a character as to admit of their being taken out and restored to the socket without doing violence to the parts. It has been suggested by some that a divergent root might be taken off, so that the tooth could be placed back with its two buccal surfaces in position and be serviceable. I have never

attempted that operation. Whether it is practicable or not, I do not know. I should think, however, that it was certainly worth the trial.

With teeth of a single root, this is certainly, so far as my experience goes, a valuable mode of treatment in certain classes of alveolar abscesses. The tooth should be removed and all the debris and imperfect tissue taken away, even to the removal of the entire periosteum of the root, if necessary. Then the tooth should be carefully restored to its socket, and in the majority of such cases, the result has been admirable.

There will be cases where difficulties will occur, as where large cavities are formed by an accumulation of pus around the root, and it may be that in such cases the operation is not practicable. I have not had sufficient experience to venture an opinion; but we know in alveolar abscess, where the gums around the socket are wasted away, they are reproduced again. The diseased tissue is removed and nature has an opportunity for reparation—for bringing plasma to the diseased part and organizing it into tissue. I remember a case, a number of years ago, of a gentleman who had six or seven teeth with very large cavities extending down to the ends of the roots. The tooth structure had exfoliated until, with his own hands, he had removed a large portion of the tooth, and there was a large cavity about the ends of the root, formed by the accumulation of pus, and yet, in that instance, entire reparation was made, and a bony wall was rebuilt on the outside of these teeth, making them firm and strong in their position. Now, if nature will effect reparation in a case of that kind, is it not reasonable to suppose that nature will exert her recuperative and restorative power successfully where a tooth is merely drawn out and reinserted? It is a secondary formation, of course, but secondary formations, as we all know, often remain serviceable through life, and serve all the purposes of original tissue.

This operation I also consider available in neuralgia and in hypertrophy of cementum. I had a case a while ago where a severe neuralgia seemed to proceed, at intervals, from a superior bicuspid as its initial point. The tooth was not decayed, and there seemed to be no inflammatory action about it. There was, however, a slight uneasiness under percussion, and this fact, together with the fact that the pain seemed to start from that point, led me to conclude that the difficulty was with that tooth. I therefore removed it, when I found considerable hypertrophy of cementum, considerable redness, and inflammation of the periosteum, and considerable hypertrophy of cementum.

I scraped this all off, down to what I supposed was the original surface of the cementum, taking off all the periosteum from the neck to the point of the tooth. I then replaced the root in its position again. There was a little soreness for two or three days. That, however, diminished quite

rapidly, and I have just received a letter from the patient, saying that she had not had a twinge of neuralgia since that tooth had been taken out. I had another case very similar to this, attended by about the same result.

In reference to the treatment of alveolar abscess: I had a case where there was an abscess of the inferior second bicuspid on the left side—an abscess with an external fistulous opening, half or three-quarters of an inch above the lower margin of the jaw. The patient was a gentleman of rather feeble constitution. This bicuspid had been filled a number of years ago on its posterior proximal surface. He consulted a physician, and was advised by him to have the tooth removed, as the fistulous opening was making a rather unsightly appearance, on account of the depression which was taking place more and more. I consequently removed the tooth, and then cleansed the root, removed the debris, and scraped the root from the neck to the apex. I also cleansed the canal, and removed all the debris from that. I drilled entirely through the canal, filled the tooth completely, and having done all I thought necessary—cleaned the socket out thoroughly—I replaced the tooth.

This cleansing the socket is a matter of considerable importance. It is a good idea to use some kind of an antiseptic in the socket. In this case, I dipped the root into a solution of phenol sodique. There was some soreness for three or four days after, but in a very few days he was using the tooth in mastication. We were somewhat exercised as to what would be the result of the fistulous opening. It, however, in a few days ceased to discharge.

In regard to the depression in the cheek: I directed him to put his finger into his mouth and press that part of the cheek out, and to manipulate it. I saw the case a few days since, and at that time you could not have detected that there was a depression there at all.

Some thirty odd years ago I removed a second bicuspid tooth by mistake, when I should have removed the first molar. I removed the molar, and it occurred to me to replace the bicuspid tooth, which I did. The tooth, in this instance, had no support back of it.

This matter of proper support, let me remark, is an important item. The tooth should be held firmly in position, so that the plasma, which is thrown out to repair the injury, may organize itself perfectly around it, and not be subjected to irritation and disturbance.

This tooth, as I remarked, had no support back of it, but the occlusion was such that it was not disturbed, and it very soon became firm and serviceable. Dr. Watts saw that case last fall, and the tooth was then doing good service. Upon examination of it, he found some imperfection upon the crown of the tooth, and he asked the gentleman to allow him to cut into the dentine and see what the condition of the tooth was. He drilled

down and found quite sensitive dentine, whereupon he concluded that the pulp was living, and desisted from further examination.

A gentleman told me last winter that about a year before he had a tooth under treatment, which was decayed until the pulp was exposed. He removed that tooth, placed a temporary filling in it, and replaced it in the socket. A number of months after that, he removed the temporary filling, and found the pulp living, just as when he first saw it.

This operation, of course, is one to be performed with caution, and the cases where it may apparently be advisable should be scrutinized with great care. We should ascertain beforehand all the pathological tendencies and susceptibilities of the case. Attention to the nutritive functions of the system should be exercised. It is an important thing that the system should be perfectly nourished during the progress of such an operation. I think if proper judgment is exercised, this operation may become an important element in dental practice.

Dr. Sturgiss (Illinois): In regard to this question of cohesive and non-cohesive gold. I think that both are important factors in securing the highest success in a dental practice. In restoring the contours of teeth, I can make better operations with cohesive gold. In cases where I have very sensitive dentine, I have found it advantageous to commence the operation with soft foil and finish off with cohesive. I use a deeply serrated instrument, so as to interweave my cohesive foil with the soft foil thoroughly, and I am satisfied that I can in that way make a successful operation. By allowing my foil to project somewhat over the edges of the cavity I am able to condense it along the line of junction—swedge it over the edges, so as to make a very tight filling. If I can accomplish this to my satisfaction, I am not so much concerned about the center of the cavity.

In regard to this matter of replanting and transplanting teeth. I must confess that I do not wholly agree with the views which have been advanced. So far as my observation goes I am convinced that transplantation is quite frequently a provocative of abscess. I think that replantation may be made for purposes of articulation, and for the purpose of preservation of the teeth, and restoration of facial symmetry; but in such an operation you have cut off the vital force, and the tooth is dead. A dead tree will stand for years, and so, also, will a dead tooth, but it draws no elements of vitality from the system. It is a dead tooth, and I have not much faith in any thing which is dead, when employed to serve the purposes of a vital agent. I think it is far preferable to save a tooth without destroying its vital connections, when possible.

Dr. Field: Last April I called upon Dr. Morrison and found him engaged in this business of replanting teeth. He was engaged in filling a

tooth, which he held in his hand, wrapped up in a piece of bibulous paper. He explained that he was performing the operation for a lady, who was then in waiting in the next room. While he was at work the lady came in and said she would return in about half an hour for her tooth; and away she went, leaving her tooth in the Dr.'s hands, the same as you would leave a pair of boots at the shoemaker's.

This tooth was perfectly cold, and apparently dead. If such an operation as this is practicable, then it is certain that we have effected a great revolution in dentistry. I would like to ask Dr. M. if the operation was successful in this instance?

DR. MORRISON: I will state that it was thoroughly successful, and the tooth is now worn to the lady's perfect satisfaction.

DR. ATKINSON: There is so much here that has grown out of the two papers, and the remarks made upon them, that it will be utterly impossible to give even a glance at the different views which have been advanced.

There is a point at which all function has a beginning, and it has a career, terminating either in an abnormal arrestation of its functions, or through having accomplished the intent of its being.

The subject under consideration is, what constitutes the cohesiveness or non-cohesiveness of substances that we use for filling teeth? It is precisely the same that constitutes the coalesence, differentiation, or standing apart of any other two bodies. Any skinless body being brought into contact with another skinless body, coalesces with it. Take two lumps of jelly, or protoplasm. Bring them into contact and they become one lump. Now, what is the reason that what is called sweet oil does not cohere upon mere contact? It is that there is that upon it which answers the purpose of a skin, or a pellicle upon the surface. Remove that and you have your cohesive quality restored.

Now, it is this very principle to which we must look for success in replantation and transplantation of teeth. It is through the presence of the blood corpuscles, or lumps of jelly, that constitute the plasma out of which new tissues may be constructed—fused together by means of this principle of coalescence.

I could give you many instances of cures of abscesses where the teeth had been extracted, and where the pulps reunited; but it does not do to say that a pulp united and performed its function as well as ever.

It has been said here, further, that men are capable of determining constitutional conditions, to a degree necessary to justify them in saying that such a tooth is capable of being transplanted or replanted. It is not so. The most eminent authorities do not claim any such power. In order to

recognize constitutional conditions which may bear upon the success of the operation, it is necessary that they be present in an active form, and not in a latent form.

Prof. Abbott's paper was valuable for its review—a review extending back as far as Hunter. If there is any thing that is marvellous, it is that Hunter should have known as much as he did know about the matter: for they had not then learned how to dissect so as to be acquainted with the tissues—their number and nature. Hunter must have been considerably in advance of his time, for he has given us some very valuable suggestions, and in the conclusions at which he arrived, he was generally sound.

In regard to the union of the cock's-comb with the outer and inner circulation of the tooth put upon it, that is still to be seen in the London museum, and settles the question for all time, that a tooth may be reunited, even to the tissue of a bird. That justifies me in the principle I have often advanced: that when points are brought in contact without obstruction, and are plastic in their nature, they unite irrespective of the order in which they are found. Birds, for instance, have no diaphragm; they do not belong to the order of mammalia. They propagate their young by eggs, and the eggs are hatched externally of the body of the one producing the egg. They are so entirely different from mammalia that we would naturally say there was no union possible, but that one single instance I have mentioned, fully establishes it as a thing possible.

The second paper was not so general in its assumptions, nor so sweeping in its assertions; but it was one which I admire very much for the clearness of its statements, and the application of its arguments, which were very forcible and logical.

Prof. Shepard spoke of the union of two surfaces of gold, by contact of the molecules. Are they molecules? By no means. A molecule is a compound body; that is to say, it is a body resultant upon the satisfaction of affinities resident in two or more kinds of atoms, under the influence of a current of energy, which is generally electrical. Loosely speaking, and by a sort of accommodation, the term molecule is used to signify something indivisible, but it is a compound body. A regular aggregation of these molecules constitutes grannles; and another regular aggregation of these grannles constitutes cells, and here we have the elements of the tissues. When we are dealing with a simple body, such as gold, we have no molecules. We have simply individual particles, and when these are naked, nothing deposited to act as a skin, they unite.

Dr. Thomas: About the first of last April, a girl of some seventeen or eighteen years of age, apparently in the enjoyment of general good health, presented herself for treatment, the trouble being an abscess about the

root of the second inferior bicuspid. I extracted the tooth, when the idea of replanting it occurred to me. I accordingly put the tooth in a glass of water, mixed with a little alcohol, and went on with my work. At the end of the forty minutes, after I had dismissed my patient, I took this tooth into my laboratory and washed it clean, cut off the end of the root a little, and polished it down. I took particular pains to clean off every thing there was upon the cementum. Then I opened up into the cavity, and thoroughly cleaned it from the dead pulp, going to the end of the root, and filling it with Hill's stopping. I then filled the cavity with amalgam, and cleaned the socket as thoroughly as it was possible to do. I then replaced the tooth in the socket. I had little expectation of success, and less because the contiguous molar tooth was gone, leaving this tooth unsupported. I was, however, agreeably disappointed. There was considerable soreness, but in three or four days that passed off, and the tooth became firm in its socket, answering every purpose of mastication as well as ever.

Dr. Corydon Palmer: When you have simply filled a tooth you have only done what any jeweler could have done, and done better. There is more difference between cohesive and non-cohesive foil than simply a pellicle on the surface. Soft foil does not harden under the instrument. The repeated heating of the foil reduces the cohesive quality. It may be damaged by too much handling. Any thing can be done with cohesive foil that can be done with soft, and a great deal more. [Dr. Palmer made some extended remarks, but they were inaudible at the reporter's table, and are consequently necessarily omitted.—Reporter.]

Dr. Winder: At the age of sixteen, through the carelessness of a dentist, I had a perfectly sound bicuspid extracted in place of a decayed sixth year molar. It was extracted about eleven o'clock in the morning of one day, and was replanted about four o'clock in the afternoon of the next day.

For twenty years I knew no difference between that tooth and any other, except that it was slightly discolored. During the twenty-first year it began to get a little sensitive. In the twenty-second year after this operation it would occasionally, in the morning, be elongated, and I would have to bite it back into its position. I wore it until the twenty-fourth year, when it had to be extracted.

In regard to cohesive gold foil, it is a very important point not to damage the surface by handling. It is important that it be handled in such a manner as to be kept clean throughout the whole operation. As it is well known that it is heat which imparts to it the principle of cohesion, it is important to us that we have the right degree of heat.

If you take your gold just as it comes from the gold-beater's, having allowed it to remain untouched and unhandled, you have the best possible

condition that the gold can be in. It may not be known to you that repeated heatings depreciate. It should be taken just as it comes from the gold-beater and rolled up, not too tightly. In that way it can be kept any length of time without losing its beautiful metallic surface. Kept in this condition, and properly worked, the most perfect fillings can be made. It is just as soft and well adapted to its place as soft foil. If it is not worked too much, you can uniformly get as good results as with non-cohesive foil.

DR. MCQUILLEN: It is perhaps well that we should have a clearer definition of the difference between cohesion and adhesion, than has yet been given.

According to the best authority, cohesion acts between particles or bodies of the same kind, and at immeasurably small distances. To this is referred the phenomena of solidification and crystalization. Adhesion acts between unlike substances at immeasurably small distances, and forms mixed masses.

I would state that in 1856 or 1857, when it was first proposed to render gold more cohesive by passing it over a lamp, I instituted a series of experiments, and as a result came to the conclusion that the soft foil was better adapted for the purpose of filling teeth than gold so annealed.

I took a plate of steel in which a hole had been bored, this plate slipping into another by a kind of dove-tail arrangement, and packed this hole thoroughly with soft gold. Then I slipped the plate out and had a perfect cylinder of gold.

I subjected the annealed gold to the same process, and I found I could not get as much annealed gold into the same cavity with the same force, as I could soft foil. There was a difference of about one grain in ten. Applying the result of these experiments to our operations, it seemed to me that we would have the same result. I have since, however, learned to recognize a value in this annealed foil. In a majority of operations, indeed I may say in all operations, I would use this soft foil, and then in finishing off the filling, the annealed foil may be used advantageously.

DR. CROUSE: I think there has been too much of an indorsement given to cohesive foil by this body—a body which is so authoritative, and which exercises so much influence over the methods of practice adopted by the average practitioner.

I commenced with soft foil, and have used it mostly in my practice. I have, however, fully tested the merits of cohesive foil and have made successful fillings with it, but I am able to do much better work in less time, by the use of soft foil. Unless you are very thorough with your cohesive foil you will have failures.

There is another part of the discussion which I do not wholly approve of: that is the laying so much stress upon the replantation and transplanting of teeth. I think it is very rarely necessary. A man ought not to be driven to this recourse more than two or three times in a practice of a lifetime.

As to alveolar abscesses, I do not think I have seen a hundred in ten years, and when I have had them I have found no difficulty in treating them successfully, by much less violent methods and remedies.

Prof. Shepard: I find that I have been somewhat misunderstood in the remarks which I made this morning.

I drew a diagram as an illustration of what always takes place in a greater or less degree, wherever cohesive gold is used. If the gold is in the form of a rope, then it is in the form in which there are most arches shown. If it is in the form of a mat or ribbon, where a dozen or twenty thicknesses are used, one on top of the other before it is annealed, there are points of contact enough, uniting layer to layer in the mass, to make a series of elongated arches, which are really arches, although the angle is not so great as I represented it on the board. If there are open spaces at all, and if there are points of contacts to make arches, just in proportion to the size of the mass will you have difficulty in effecting a thorough condensation on account of the case-hardening at the surface, consolidating a few of the arches at the top and at the bottom.

If you take a mass of non-cohesive gold and make a cylinder, having twenty or thirty of the folds going round and round, and then apply force to the cylinder or to the side of it, there is no case-hardening, no resisting air-chambers and arches, but the force is exerted equally throughout the whole mass. The advantages of using non-cohesive gold in this way are, that it can be used with great rapidity and with very uniform results, adapting itself beautifully to the inequalities of the dentine. Cohesive gold may be profitably used where the nature of the case demands the strength of welded gold, as in contour fillings, turning corners, etc.; but I think in almost all other cases non-cohesive gold is best adapted to the purpose.

Dr. Palmer asserts that it takes a long time for non-cohesive gold to get heated red hot, and that after it is heated red hot, if you hammer it, you will find that it will heat again more readily. This he attributes to a consolidation of the molecules. He mistakes the cause. The cause is due to the film of oil upon the surface, preventing it in the first instance, from becoming heated so quickly. Upon this same principle workers in iron will, after first having immersed their arm in water, plunge it with impunity into molten lead. It is protected from the immediate effects of the heat by the film of water.

Dr. Butler: It is certain that non-cohesive gold has been used a much longer time and perhaps, if careful statistics were preserved, they would prove non-cohesive gold to have been more successful than cohesive. But that may be due to the latter's having been improperly manipulated. I believe it to be absolutely necessary, in order to secure the best results, to adopt the elective mode of practice. There has been considerable discussion on the subject of how to make gold cohesive or non-cohesive. You may take gold that has been brought to the cohesive condition and anneal it a few times, and you will find it less cohesive than it was; therefore it is better not to tamper with it after it leaves the hands of the beater. But we seem, in this discussion, to ignore all other materials for filling the teeth. There are cases where neither cohesive or non-cohesive gold will answer the purpose.

Tin is an excellent material. At certain ages and with certain teeth, nothing is better than tin as a preservative. With gold, it is frequently the case that our best fillings fail, as though we had put in an entirely foreign substance—one entirely incompatible.

Dr. Clowes: The great object of dentistry is the salvation of teeth. Now to say that teeth can be uniformly filled successfully with one material, is to make a statement as absurd as to say that all diseases may be treated successfully with one medicine. Let cohesive gold be used in its appropriate place; let non-cohesive gold be used in its appropriate place, and so with tin and amalgam. For many years I used non-cohesive gold exclusively, and it was a long time after cohesive gold came out before I could be induced to give it a trial; but I at last did so, and its beautiful properties very soon overcame all the prejudices I had entertained against it.

There is one point which I fear is not sufficiently appreciated, and that is that there is no salvation for teeth unless they are properly separated, and they should not only be separated, but care should be taken to round off the corners.

There is another point of which I wish to speak, and that is in regard to filling roots with osteo-plastic. The root should be thoroughly cleansed, filled with osteo-plastic, and the tooth filled with either amalgam or gold. In performing this operation the operator should be very careful not to drill through the end or the side of the root. The root should be cleansed as thoroughly as possible, and if there is some matter remaining in the end of the root, introduce a little chloride of zinc as a disinfectant.

Dr. Keely: I desire to relate a case I had of replantation. A gentleman had a second superior molar decayed, on the posterior surface. The teeth were very much crowded, and the cavity seemed to be almost inaccessible. I told the gentleman that the only way of preserving the tooth

appeared to be by removing, filling, and returning it to the socket. He consented to that method of treatment, and I therefore extracted the tooth. I found on the anterior proximal surface of the third molar a large cavity, which I filled, and then turned my attention to the tooth I had extracted. I filled the root with Hill's stopping, and then filled the cavity. I presume the tooth was out about an hour and a half or two hours. Upon attempting to return it, I found that the buccal root projected so far that I could not get it back. I took the cutting forceps and cut off about one-third of that root, so that I could return the tooth. There was some soreness for a day or two, but very soon the tooth was restored to a firm and healthy condition.

Dr. Bogue said he had performed the operation three times; once it was a failure. There was an abscess from half an inch of cotton protruding through the apex. He then spoke of the restoration of a front tooth with platinum-foil in such a manner as not to be observable, and which completely remedied a hissing which had been caused by the separation between the teeth, and which annoyed the patient (a clergyman) very much.

Dr. John Allen spoke of a case where four front teeth were knocked out of the mouth of a boy thirteen years of age; the teeth fell in the sand, but were replaced and did well, and did not lose color. He thought there had been union of the lining membrane. He had had cases so sensitive that it was impossible to excavate, and had extracted and returned with success, though he had had failures. He also mentioned a case of a lady who had a front tooth which appeared to be of much better quality than the rest, and on inquiry she stated that that tooth was extracted from her little negro boy's mouth and replanted in her own; it had done well.

REPORT OF THE COMMITTEE

ON

DENTAL CHEMISTRY.

By S. B. PALMER, Chairman.

Your Committee on Dental Chemistry, after due consideration, thought it advisable to so divide their labors that each member of the committee could furnish a report in accordance with his own course of study and investigation.

Having undertaken the task of presenting what appears to be newly applied principles, in connection with chemical and electrical action in the oral cavity, I present the following extracts from the mass of dental literature, accumulated within the last twelve months. Great care has been taken to present for discussion such claims, theories or principles only, as we believe relate to applied dental chemistry. This will account for the omission of many valuable discoveries in general chemistry, as well as much that relates to this subject, that could not be incorporated in a single report. It must be apparent to all that there is an increased interest manifest in the too long neglected department of dental chemistry. In quoting from the papers before us, we wish to be guided by justice in giving credit where it is due; still, for the advancement of science in this direction, we deem it our first duty to present principles, not men, and, so far as we are able, facts rather than theories, as topics for discussion.

The first paper from which I will make extracts is by Henry S. Chase, M. D., St. Louis, read before the Illinois, Iowa and St. Louis Dental societies. As this paper is quite lengthy, and has been published in several of the journals, I will only give the fundamental principles there defined, connected by quotation from other sources, in a manner to give definite ideas of the claims for truth in the study of nature, and its relations to conservative and operative dentistry.

Dr. Chase commences his paper on oral electricity by comparing the oral cavity to a single cell in a voltaic battery, wherein the mixed saliva, decomposing food, together with acids of fruits, drinks, etc., answers to the fluid of the cell. According to electrical laws, the greater the departure of the oral fluids from a neutral or slightly alkaline saliva, the greater the chemical effect upon the tooth substance or dentos, as called by the author. Voltaic electricity having the power to disintegrate even metal, as well as animal and vegetable substances, has also the power to decompose dentos. Ordinarily, the healthy mouth is not in a condition to disintegrate dentos. This departure is brought about in various ways. Thermo-electrical currents are set up by sudden changes of temperature. There are more or less hiding places in the fissures of the teeth and between them, in which the mixed saliva has sufficient power to set up electrical action. There is probably more or less electricity evolved in the ordinary mouth nearly all the time, more especially if there is a tooth plugged with *any metal whatever*.

The writer says: "Electrical currents probably do no harm, excepting when, by their quantity, intensity and constant direction, they produce chemical disintegration of dentos, or produce pathological changes in the pulp or contents of the dentine tubes." "When plugs leak so as to allow the mixed saliva to permeate between the walls of the cavity and the plug itself, we have in each such tooth a battery, and there are as many batteries of a single cup each, in the mouth, as there are such leaky plugs."

To illustrate this a figure is introduced, which is well known to those acquainted with voltaic electricity, viz.: when a plate of impure zinc is used in a battery, between the zinc itself and the particles of other metals which the zinc may contain, innumerable batteries are formed, the sulphuric acid acting upon these metals with different degrees of energy.

Voltaic batteries for mechanical purposes are usually constructed of two metals or elements, one of which is not acted upon by the acid, the other easily acted upon. Currents, however, are evolved from two metals, both of which are acted upon by chemical agents, or between them and other substances. The electrical current passes from the positive to the negative element, and that element is called positive which is most easily acted upon by the fluids in which the elements are immersed, and that element is negative which is less acted upon than the positive, with which it is in the

circuit. Change of the fluid of the cup will often change the relative position of the elements. Lead is positive to copper in nitric acid; but in a solution of sulphide of sodium, copper is positive to lead. Dr. Chase then says the elements of batteries, which are sometimes found in the mouth, are enamel, dentine, muscle, gold, dental amalgam, tin, guttapercha, and oxy-chlo. zinc. Each metalic plug forms a battery by its union with the tooth in which it is placed. If the plugs are water-tight, then the electrical action is limited to the margins of the plug; but if the plug is leaky, then there is electrical action set up within the cavity at every point at which the filling and the dentos touch.

These statements sound much like those contained in the report last year, which originated in the committee. I feel greater freedom in presenting them at this time, since the late experiments originated outside of the committee, and are the result of long and patient investigation, as your committee can well appreciate. "A thing is never too often repeated which is never sufficiently learned." If we should spend a day upon this subject and then arrive at principles, so that we could be directed thereby in our practice, this would prove a satisfactory session.

In returning to the paper—passing over pages full of truthful figures and suggestions—we find this pertinent statement: "Every material for plugging teeth is negative to dentos; consequently dentos is placed in a critical position by every plug which it receives, because it is *positive* to every dental plug." That material which stands nearest to dentos on the potential scale, would give the greatest assurance of safety, so far as disintegration of the tooth substance could be caused by electrical currents, and by its association with a negative substance to form a battery. Quoting from an article in the July number of the Dental Cosmos, 1876, by the same author, the title of which is: "What shall we fill teeth with?" he says: "We now know that gold, being so much further removed from dentos on the electro-positive scale than any other filling material that we now use, it is the most dangerous one we can plug a tooth with, if preservation of the latter is the sole motive for the operation; but when beauty is considered, it must often be used at the risk of less permanency.

"The best of alloys are safer than gold in any cavity, but would generally be thought advisable only in the posterior teeth from considerations of appearance." Pure tin foil," he says, "is safer than gold in any cavity in which it can be properly placed; but as it is very soft, and will not withstand mastication more than three or four years on grinding surfaces, its usefulness is thereby circumscribed. Its use must be limited, in a great measure, to back teeth, as its color is no better than that of modern improved alloys, which keep their original color."

Mention is then made of using gold and tin combined, which gives the

optical effect of gold, and yet has all the effective preservative influence of tin, by lining the cavity with tin and filling with gold.

In a paper read before the Dental Society, of the State of New York, at Albany, July 13th, headed: "Choice of materials for filling teeth," the electrical action resulting from this combination, is defined in the following manner: "So long as a filling of gold and tin remains moisture-tight, there is no action, no current beneath the plug, which is the case with a plug of any material. 'The whole need not a physician, but they that are sick.' When the plug fails to exclude fluids, or the moisture reaches the plug through the poorly organized dentos, the tin becomes oxydized to a greater degree, by reason of its connection with a negative element, the gold. As the oxyd of tin is the antiseptic sought to arrest decay, this is furnished in greater abundance by combination. As the tin becomes encrusted by the oxyd thus formed, like any battery with its plates oxydized, the current ceases, and thus the tin is saved from further loss. The same principle underlies all alloys.

In connection with this subject, the same paper mentions the action produced by two or more fillings in the same tooth, or in close proximity in opposite teeth. I mention this particular point in practice, because facts and former theories disagree. Theories based upon the non-conductivity of dentos, do not allow contact between fillings when it is possible to separate them. Science teaches that each separate filling in connection with dentos is a battery; thus two fillings separated by a thin partition of dentos are two batteries, both acting upon and through the separating walls, to their speedy disintegration. When firmly connected, the two fillings assume the character of two metallic elements—a single battery. Metals being by far better conductors than tooth structure, the current and action is confined to the plug, while the dentos, which in case of a single plug is one of the elements, in this instance is no longer so, but the cup in which the elements are placed. To better illustrate this action, imagine the hands grasping the poles of a powerful battery; while in contact the current cannot be perceived; on separating, so that muscle forms a part of the circuit, a shock is the result. This principle gives license for piecing out gold plugs with amalgam if necessary, without injury to the tooth or irritation to the dentine. Approximate fillings of gold and tin or amalgam, must be regarded as two distinct batteries, when by the introduction of food or any conducting medium they become connected, the current passing through the dentine and pulps, if the latter are present, to the great annoyance of the patient. Since this class of fillings cannot be firmly united, chemistry teaches that they should be thoroughly separated.

In reviewing a paper by Thomas Fletcher, M. C. S., Warrington, England, read before the New York Odontological Society, December 21, 1875,

with regard to discoloration of amalgam fillings upon the surface in contact with dentos, Mr. Fletcher, after giving the results of numerous experiments with various alloys, says: "These experiments have resulted in what I believe to be the discovery of an absolute law which rules all plastic fillings, and which not only gives a process for testing all new compounds with certainty, but also gives the conditions under which any special alloy requires to be worked to give the best possible results which can be obtained with it. The foundation of this law or principle is "Given—any crevice or joint between two surfaces, one or both of which can be made to yield to pressure, the presence of moisture at the edge of the crevice or in the body of one of the surfaces entails the parting of the two, and the penetration of moisture by the force of capillary action, if an excess of moisture is present, the amount of this penetration being ruled by the ability to yield, of the side or sides of the crevice. This power is always ready to act, and is sufficient, in the course of weeks or months, to entirely change the form of any filling which will yield to constant pressure."

In the estimation of your committee, the principle claimed by Mr. Fletcher is worthy of consideration. He claims to have proved its correctness by practical and theoretical tests, and I believe the observation of others will confirm this statement.

Further on in this paper Mr. Fletcher gives the results of experience and experiments with oxy-chloride as a material for permanent fillings, in a manner quite convincing that he is well acquainted with its action and durability.

In private correspondence he acknowledges what all, who use it, come to learn, that we are either in want of a more reliable article, or a law by which to use that we have, to secure positive results. The electrical tests by your committee predict that chemical law is against the universal success of a compound of the nature and composition of oxy-chloride. While it may withstand the action of diluted hydro-chloric acid, it is itself decomposed by alkaline secretion. Much has been said in favor of this material during the past year, even for permanent fillings; yet, in every paper, so far as my observation extends, there has been quite a margin left for irregularities in its results. Permanency of oxy-chloride is yet to be obtained. It is built up by certain laws of chemical composition, and for most uses to which such an article would be applied, would be faultless. When in the oral cavity it is brought in fluid contact with a wide range of elements, some of which appear to have affinity for its constituent elements, decomposition is the result. Thus we seem to be without a positive principle to warrant success in the use of this material.

The following extract is from the New York Medical Record, by Dr. J. E. P. Hodson, M. D. Though there may be nothing new to the observing

dentist in this quotation, it shows that the medical profession, too, is investigating these subjects for the benefit of humanity. He says:

"In any illness, involving a feverish condition, the fluids of the mouth are constantly and intensely acid, as respects the teeth, as in any medicine administered by the physician; and moreover, from the high temperature of the buccal cavity, at such times, the power of these acids for evil is greatly augmented. Further, a direct consequence of these conditions is the especially rapid fermentation and decomposition of all food lodged between and around the teeth, and the consequent elimination of other deleterious acids, all forming a mighty power, under which it is not surprising that the tooth structure should melt away like dew before the sun. It is, indeed, a very surprising thing that any tooth should live to tell the tale."

Time allows the presentation of only one more of the many promises of chemistry for the advancement of dental science.

The discovery and application of an agent intended to be introduced under gold, or other fillings, for the purpose of allaying irritation caused by the plug, to reduce thermal shocks, arising from sudden changes of temperature, etc., has come to my notice through Prof. E. W. Foster, M. D., of Boston. I am not aware that this claim of Dr. Foster has been made public through the journals, and furthermore, I do not know to what extent your committee ought to introduce it at this time. I trust Dr. Foster will overlook this premature mention, if such it is, since I understand that he is only waiting to collect facts and data sufficient to warrant its use and adoption. After many experiments and careful observation, he concludes that hypo-phosphite of lime introduced into a cavity previous to filling—the process I will not here describe—will, in addition to the above-mentioned benefits, enter into the dentine tubes, and in a measure do for a poorly calcified tooth what nature failed to do, restore it in a degree, to a normal condition; in other words, it is an external application of a material of the character of dentine, which saves the latter from outside disturbances, while it stimulates nature to complete the work of calcification within, as it could not do subject to irritation. Tests already made by your committee, to ascertain its relation when compared with dentine and the various materials used for fillings, show wonderful harmony.

Your committee mention this subject in hopes that some of our Boston members may enlighten you as to the utility of this new application.

In the collection of matter for this report, your committee has endeavored to act as your assimilative agent, collecting from the mass such claims for facts and principles as we thought would be discussed, digested and appropriated towards the strengthening and building up of this body. I think it must be apparent that we, as a scientific association, have yet to learn principles, of which we are still ignorant, respecting the chemical relations and action of matter with which we have to do.

SLEEP VS. ANÆSTHESIA.

By J. S. CASSIDY, of the committee on Dental Chemistry.

Fully appreciating the difficulty of proving by experiment the nature of the chemical changes that take place between any substance when introduced into a living body, and the tissues which it affects, the writer nevertheless believes that a large number of these changes may be suspected, if not proven by analogy; and this in the light of a partial knowledge of the physical and electrical behavior of certain individual elements, under stated conditions, may serve to render our theories advanced in this connection, not wholly devoid of seeming probability.

It is evidently not unreasonable to assume that a substance capable of subduing all the special senses of a physically perfect animal, must either act of itself as a direct poison, or conversely, as a factor with power to induce such chemical reactions as will result in the formation of new compounds, which latter, in their molecular incipiency, produce the requisite insensibility to pain, and are, therefore, the real anæsthetic.

There appears to exist a vague impression in the minds of many scientific men that there is a very close relationship between anæsthesia and natural sleep; that the difference is merely in degree, not in kind. There is, however, a wide distinction between these phenomena, if examined in regard to their chemical relations.

Anæsthesia is certainly opposed to the natural order, by involving increased chemical action, frequently to a stage beyond functional control, thus reversing the normal conditions through which vitality is maintained; while, on the contrary, sleep is a negation of molecular death. Its unconsciousness is the concomitant of chemical nihilism. Although, within reasonable limits, a voluntary suspension of certain functions, it is not

rational to suppose that sleep is exclusively a negative condition, a mere cessation from wonted activity, a "rest for the weary," but rather, in accordance with all the known laws of nature, which teach that in order to repair an acknowledged loss, there must be a proportional restitution of the matter or force abstracted, we premise that sleep *per se* has to deal with a positive entity, that it is a process to accumulate a tangible something, removed from the body by mental, physical or functional exercise.

There is, indeed, a strong probability that the chemical changes coincident with animal life, are in the main, processes of oxidation. But if oxygen be the potential element through whose union with other kinds of matter each thought, word and motion is produced, whence comes it in quantity sufficient to support such processes? We answer that it comes only during periods of physiological inanition, when mind and body are at rest, and that while in repose the system receives and appropriates its quantum of oxygen, commensurate in amount with recent expenditure of force, and to serve as a reservation for supporting the retrograde metamorphosis of tissues during the immediately following hours of labor.

Careful observations have demonstrated the fact that there is relatively more oxygen inhaled and less carbonic acid exhaled by a healthy animal while enjoying the apathy of sleep, than occurs in a like space of time devoted to physical or mental exercise; while on the other hand a vast increase in the production and expulsion of carbonic acid is occasioned by violent physical exertion, out of all proportion in quantity to the oxygen simultaneously inhaled.

These facts indicate the proposition that the oxygen inhaled during the regularly recurring hours of labor is devoted mainly to the duty of assisting the carbonic acid to penetrate into the pulmonary air cells by means of a quasi gaseous diffusion, and that the comparatively small volume of oxygen which disappears at this time is appropriated by the ferrous carbonate present in the circulation, in order to change the iron compound into the required ferric oxide.

In short, we submit that sleep is an oxygenating process, and that while in the opposite state, i. e., awake, the aeration of the blood does not consist so much in the reception of oxygen, as in the expulsion of carbonic acid.

Now, what bearing have the foregoing considerations upon the therapy of anæsthesia as manifested by nitrous oxide, ether, etc.

Nitrous oxide, as its name implies, is a compound of the gases nitrogen and oxygen (N^2 O). Chemically, it is similar to atmospheric air, except that it is far more energetic than the latter, a property due to the large proportion of oxygen it contains, and to the fact that in any known reaction, in which it directly takes a part, this element, its only active principle, assumes the nascent state. It does not unite directly as a compound with

other bodies, but it readily suffers decomposition at varying temperatures, under the influence of oxidizable substances; and in this light only can it be viewed as a supporter of either combustion or respiration. It possesses an oxidizing power greater even than free oxygen, and in many cases equal to ozone. If a metal be attacked by it, a metallic oxide will be formed. If a hydrocarbon be burned with it, the formation of the normal oxides respectively of hydrogen (H^2 O) and carbon (C O_2), will ensue. Indeed, oxides are the only class of compounds it appears capable of forming.

Now, as there is but *one* science of chemistry, we are compelled to admit that the same laws which govern the decomposition and recomposition of definite compounds, apply as well to those changes which occur under the influence of vitality—minus soul or spirit—as to the ordinary reactions that take place in the inanimate world; and inasmuch as nitrous oxide is a supporter of combustion only by virtue of the oxygen it contains, we are free to believe that it also supports animal respiration only by means of the same qualitive property. A course of experiments, covering a period of several years, has convinced the writer that nitrous oxide *is* a supporter of respiration, provided the carbonic acid—which accumulates under its administration much more rapidly than during ordinary breathing—be freely and continuously expelled. If this precaution be observed, the experiment may continue almost indefinitely, with regard to time, the individual, meanwhile, being natural in feature and perfectly unconscious to pain; but if the exhalations be not regulated—as in the ordinary administration of the gas—with this object in view, an alteration from the natural to an appearance bordering on the horrible, immediately follows, affording all the visible evidences of partial poisoning with carbonic acid. Such a condition necessarily interrupts further proceedings, being analagous, in many respects, to the cessation of ordinary combustion in a closed vessel, until the excess of the non-supporting gas (C O^2) is removed.

Moreover, as nitrous oxide has not the ability to support combustion in its capacity of a compound (i. e., without itself undergoing decomposition), it is more than probable that it also refuses, in its nature of a compound, to support respiration; but rather that it acts thus, in addition to the familiar anæsthetic effects it produces, through a divorce of its constituent elements.

We can not, of course, follow the reactions in detail, albeit we must remember that, unlike the inhalation of atmospheric air, both nitrogen and oxygen unified into an individual substance, are introduced into the circulation, and thence reaching the vivified ultimate molecules, whose death is correlative with physical life, their bond of union is overcome, and agreeable to the circumstances of the polarity of the elements involved, the formation of new bodies results. The oxygen set free is enabled, while in its nascent state, to supersede the prerogatives of the passive oxygen of

reserve obtained in sleep, thus occasioning a rapid increase in otherwise natural reactions; notable among which, is a greatly augmented development of carbonic acid. This latter substance appears to be the only appreciable product of the internal reaction of nitrous oxide, and there is no antagonism to any scientific fact in our advancing the assumption that, to the excessive development of this gas, is due the special anæsthesia. Certain it is, that in moments of great physical or mental effort, when, as before stated, the quantity of carbonic acid is proportionately increased, the sensorium is invariably less susceptible to the perception of local injury.

Perhaps, indeed, the mere luxury of living, the molecular interchange consequent on the exercise of any function pertaining to sentient animals, would be unendurable, were it not that these changes are accompanied by a co-existent and co-extensive evolution of carbonic acid, possessed with properties to restrain the effect of force on matter, and to tone the sensibilities to the requisite degree of harmony with nature's wants.

We do not claim that carbonic acid is an anæsthetic, in the ordinary meaning of the term. Its power to extinguish life, when received by inhalation, is too effective to admit of its use for such a purpose. Notwithstanding, there can be no difference in its nature, whether produced by synthesis or analysis; its influence on a living body is modified according to the circumstances and source of its production. Being a ubiquitous and continuous product of a wonderful living laboratory, it could not, when developed in excess by any internal exciting cause, effect therein, an approximation to the injury sustained through *inhaling* an almost inappreciable quantity.

The employment of anæsthetics, if at all admissible, should obviously be restricted to those agents which act only by virtue of decomposition when inhaled, thus inducing simply the requisite increase of natural chemical reaction, in contradistinction to those bodies which, unchanging, act directly, and are therefore immediately incompatible with normal functions. Of this latter class, chloroform seems to be a true representative. Even when exhibited in small volume, its ability, so often manifested, "like a dagger propelled by hate," to smite the heart unto death, is suggestive of this view, to say nothing of its well-known chemical nature.

In the first class we include with nitrous oxide, ethylic oxide, or common ether. Its molecular construction, and better still, the comparative absence of attendant evils by its use, favor such an hypothesis. But, as the consideration of its method of action would involve much more space than should be allotted to us here, and as dogmatism might appear as an excuse for brevity, we are constrained to restrict this paper to its present limits.

VOLUNTEER ESSAY ON SOLUTION.

By J. TAFT.

In the work of growth and disintegration in the organic and the mineral kingdoms, an important part is due to the alternate change of matter into a fluid condition and its subsequent return to a solid form. In most cases such changes are possible by the agency of heat; but high temperatures are not generally necessary for giving fluidity to the constituents of the great works of nature and of art, and in the vast operations of the visible world, as well as in the domain of life, the end is accomplished by means of solution and precipitation. The exceedingly small amount of lime dissolved in the ocean and constantly introduced by the waters of many rivers, furnishes materials for the growth of the shells of innumerable mollusca. The phosphate of lime introduced into the blood in small quantities by nutrition, affords material for the growth of bone in the animal economy. The sap of trees also seems to act as a solvent for the various substances which are absorbed from the soil, or produced by the agency of vital forces.

Solution is a liquefaction of a solid by means of a fluid, and is wholly different from the mechanical suspension of a powder in a liquid, which allows it to fall after agitation ceases. The mud of rivers is suspended temporarily in this way, but the salt of the ocean is permanently held by its waters and can not be separated by the mere agency of gravity. Some doubts prevail as to the exact nature of the forces which occasion solution; some writers regarding it as due to the physical effects of adhesion, but others, reasoning from a more careful consideration of facts, look on it as a weak modification of the force of affinity. As in the case of chemical union, solution proceeds between different substances in a manner which experiment alone can reveal. Water is a good solvent for a large number of salts, but it fails to dissolve resins, fats, oils, and other substances which

are readily soluble in alcohol. Yet alcohol is incapable of dissolving gum, common salt, and other substances, which readily yield to the solvent power of water.

The influence of heat is generally very favorable to solution. At the freezing point, water dissolves only about 3 per cent. of its weight of alum, but it will dissolve 90 per cent. at the temperature of 160 degrees F., and much more than its own weight at 212 degrees. The solubility of chlorate of potassa, nitrate of potassa, and nitrate of soda, is also much increased by increase of temperature; yet an opposite effect is to be observed in the case of sulphate of lime, which heat renders less soluble in water. Common salt, or chloride of sodium, is nearly equally soluble in hot and in cold water; but sulphate of soda has a more singular peculiarity, as its solubility increases until the temperature reaches 92 F., but decreases when the heat rises above that point.

Of other circumstances affecting solubility, pressure plays an important part, but it acts chiefly by raising the boiling point of the solvent. In the manufacture of paper from straw, the silica from this material is dissolved by water heated in strong boilers, without allowing the steam to escape. Apart from this *modus operandi*, pressure has a slight direct effect in diminishing solubility, and the subject has received much attention in consequence of its connection with certain natural phenomena. Though the rapid evaporation on the Mediterranean Sea produces a constant current from the Atlantic Ocean, at the Straits of Gibralter, it does not seem to have given the preponderance of salt due to the age which geologists assign to the enclosed watery domain. It was accordingly supposed by Lyell that salt must be deposited in the deep localities of the Mediterranean, where the strongly compressed waters failed to exert their normal solvent power. Experiments, however, though showing that pressure slightly diminishes solubility, affords no confirmation of the opinion that salt would deposit, even in the greatest depths of the ocean, which are far deeper than those of inland seas.

The solution of salts and other substances in water is sometimes attended with an elevation and sometimes with a depression of temperature. On dissolving sal-ammoniac, nitrate of ammonia, or chloride of potassium, the production of cold is very decided, but it takes place in a less degree when common salt enters into solution in water. Chloride of calcium and sulphate of magnesia when rendered anhydrous by heat, develop considerable heat when introduced into water; and the calorific action is still greater on mixing water with the strong bases or acids. These results afford good illustrations of the conflicting effects of the course of affinity and the change to fluidity, the one producing heat and the other cold. It is well known that in the liquefaction of ice there are 140 degrees of heat absorbed

or rendered latent, and the waters of crystalization being in a solid condition, cause a similar absorption, or loss of heat, when they are liquefied by dissolving. On the other hand, the slight exertion of affinity for the solvent causes a development of heat. Anhydrous sulphate of soda dissolving in water causes an elevation of temperature, but the ordinary crystals of the salt, which contain seven equivalents of water, occasions cold on solution; and the cold will be greater on dissolving sulphate of soda which had crystalized below the freezing point, and contained twelve equivalents of water in a solid form.

Yet, not only water, but almost all bodies absorb heat in passing from a solid into a fluid form; and for this reason even many salts containing no waters of crystalization produce cold in dissolving, as the heating power is very feeble. When strong bases come in contact with water, the calorific action attending a powerful play of affinity over-rules the cooling influence. In the cases considered, I have supposed the menstruum to be pure water, but the effect is modified by the presence of foreign substances in any considerable proportion. Muriatic acid, for instance, when combined with water, increases very much the cooling effects which the fluid produces in dissolving crystalized sulphate of soda.

As a general rule, salts dissolving in water preserve their characters in such a manner that they can be recovered in their original condition on the evaporation of the menstruum. Some exceptions to this rule are to be found, however, in the salts of bismuth, antimony, and some of the more rare metals. Chloride of antimony, for instance, dissolves without any visible alteration in a small quantity of water, but on making the solution weaker, by adding more water, the greater part of the salt is decomposed, and is coverted into oxide of antimony and muriatic acid. The nitrate of bismuth is also decomposed in a similar way, and a basic salt precipitated, which has little solubility. The result in these and similar instances is due to the part which solution plays in modifying the cause of affinity, the tendency being, invariably, to form compounds which are insoluble.

In the economy of animal and vegetable life, solution and precipitation play an important part, though they are further removed from the domain of exact inquiry, in consequence of the mystery which involves all vital phenomena. In the case where insoluble ossific matter is deposited from a previous solution in the blood, there is evidently a chemical change, and by separating from an excess of acid, the soluble phosphate of lime is converted into an insoluble phosphate. The separation must be ascribed to the influence of vital forces, which in this case, seems to act in opposition to chemical affinity. It is indeed true that soluble phosphate of lime, when present in the urine, is deposited, after a time, as putrefaction takes place, and the resulting ammonia neutralizes the superfluous acid. But in the

normal condition of the human system, ammonia is never formed in the blood, nor could the fixed alkalies exist in the vital fluids in a condition to produce the change.

Some analogy to the growth of bone is present in the growth of shell and of coral rocks. Shells differ from the bones of vertebrated animals, in being composed almost entirely of carbonate of lime, and in not being permeated by blood vessels. As carbonate of lime is slightly soluble in water containing free carbonic acid, and as precipitation would be caused by removing or neutralizing this acid, it would seem that shells might grow by a power similar to that concerned in ossification. The observations of Carpenter, however, have shown that the calcareous matter of shells, when viewed under the microscope, exhibits a crystaline structure, and is to be considered as a secretion, so that it may be regarded as matter abandoned by vital to chemical force. In the growth of coral, there seems to be a similar excretion of carbonate of lime. About 20 years ago, Professor Horsford, of Harvard University, advanced the idea that the growth of coral was due to the decomposition of sulphate of lime by carbonate of ammonia, the former being derived from sea water, the latter being produced by the decay of animal matter. But these views, which were brought before the American Association for the Advancement of Science, received much opposition, and found little support from any other scientist besides the author.

As to the organic matter in animal and vegetable tissue, there is much difficulty in tracing its passage from a fluid to a solid form. Liebig has attempted to explain the operation in trees, while maintaining (with Priestly) that their carbon is derived from the decomposition of the carbonic acid of the air. "The wood of a tree," says the eminent German chemist, "can not be formed as wood in the leaves, but a compound must be formed, capable of being converted into wood. This compound must be in solution, and accompanied by another containing nitrogen." The explanation seems, however, to involve many difficulties, though there is much ground for the part assigned to nitrogenized compounds in the growth of cells, to which so important a part has been ascribed by modern physiologists.

DISCUSSIONS.

PROF. SMITH (Philadelphia): I will preface the remarks which I may have to make upon the subject of chemistry, with a few words on operative dentistry. What is operative dentistry? It is that science which has for its object the preservation of the human teeth. Now, since we commenced that subject, we have been discussing gold and gold only, except the subject of the transplantation of teeth.

I congratulate you most heartily upon having had read before you one paper of incalculable value. That is the paper upon the subject of dental chemistry. That has a most important bearing on the subject of operative dentistry.

The subject of dental chemistry was fully brought out here one year ago by Dr. Palmer, and yet it remains now just where it was then, and there does not appear to be any better understanding of it now than there was at that time. Now, those principles, thoroughly understood, will place the conservation of the natural teeth a quarter of a century in advance of its present condition. But that paper was but little appreciated.

Chemistry comes in and says that in certain cases gold is one of the worst materials that can be used. It is a positively dangerous material in certain cases. Dr. Wetherbee informs us, with all gravity, that he never has any failures at the cervical walls in his bicuspids in using gold. Now we have a gentleman in this city, who has in his office a row of little bottles, and in those bottles he has some gold plugs. These bottles are all labelled, and I think, if Dr. Wetherbee could see these specimens, he would be willing to modify his statement in regard to failures at the cervical walls. Our experience here is just the reverse of that statement, and yet I venture to say that we have many men here in Philadelphia who can fill teeth just as well as he can. And these failures which occur, in spite of the best material used, and in spite of the best skill, are due to chemical changes. The question is, how to prevent this galvanic action, which exists between the tooth structure and the filling material, for that such an action does exist, there can be no doubt. And just in proportion as we advance in the scale

of difference of galvanic action existing between the dentine and the filling material, just so far does the filling material become dangerous.

We all know that there are no better preservatives of the human teeth than gutta-percha and oxy-chloride of zinc, and for the simple reason that there is not that difference between the dentine and the filling material that exists when we have placed gold in connection with dentine. So, also, amalgam, in certain teeth, is a better preservative than gold. When we arrive at perfect harmony between the dentine and the material used for filling, then we shall have destroyed this action, and not until then. Now, how can we accomplish this? One method of accomplishing it, is by the use of oxy-chloride of zinc and gold. These can be combined in such a way as to prevent this chemical and galvanic action. The gold should be isolated from the tooth structure, and in certain kinds of tooth structure we are never sure of preventing this action, unless we do this. Placing gold in connection with shaky and soft tooth structure, is one of the worst things we can do. We can place amalgam in connection with such tooth structure with far greater hope of good results.

DR. WETHERBEE: What is there about amalgam that preserves the teeth better than gold?

PROF. SMITH: I don't profess to know much about the subject of chemistry, but I do know this: in order to produce a galvanic current, we have zinc at one pole and platinum at the other. If you place between them another metal, like silver, for instance, then we have a weaker current. Now, in the other case, gold is one pole and dentine another. Now, if we place between the two some metal which will weaken that current, we have a better preservative than gold. That is the reason why oxy-chloride of zinc or amalgam is better, because they diminish the current, and we have not the same amount of galvanic action.

DR. WETHERBEE: The gentleman misquotes me. I did not intend to say that I had no failures. What I intended to say was, that I had no more failures with cohesive gold than with soft gold. I said that except with a certain class of teeth, I had no trouble at the cervical walls.

Now, that amalgam is a better preservative of the teeth than gold, in certain cases, is due, as I apprehend, simply and solely to the fact of the formation of sulphide of silver, which, in teeth that are soft and loaded with acid secretions, is a better preservative than gold.

Acrid and other morbid secretions play an important part in the degeneracy of the teeth, especially where gold is used as a preservative, and I think they are much oftener a cause of decay than galvanic or electrical action. By keeping on hand paper for testing the acidity or alkalinity of

the secretions of the mouth, the dentist can at any time determine the character of the secretion, and be able, in a great measure, if not wholly, by proper treatment, to remedy those conditions.

Dr. Barker: It has been stated here that after a tooth has been removed and then reinserted in the socket, that there is a possibility, if not a probability, of a reunion of the pulp which had been severed.

I deny that, and I am willing to be called immodest in making such a denial. Such an assertion is in contravention of all authority, and all physiological and pathological facts and principles with which I am acquainted.

The idea that a tissue of the character of pulp tissue—having the power of retrocession and contraction—is capable of reuniting after having been severed, is perfectly absurd.

Dr. Mills: It seems to me that we have overlooked a very important consideration in the treatment of the teeth, whether by one material or another. We have dwelt largely upon the properties of gold, and galvanic and chemical action, and we give them a prominence over this one simple question, which they by no means relatively deserve. I refer to cleanliness—attention to purity and freedom from any foreign deposits upon and about the teeth.

This is the secret of success, and it is utterly useless to seek for ulterior causes while we ignore this. We all know that deposits on the teeth excite chemical action, not only deposits of food, but other foreign accretions. The pathological condition of the mouth, and the conditions immediately affecting the teeth, should be most carefully studied. Inattention to cleanliness conduces to such diseases as wasting away of the alveolar process, and a breaking down of the tooth structure. I consider it the duty of every dentist to instruct his patients in this direction.

Dr. Cunningham (England): For the courtesy which has been extended to me of being present and participating in the proceedings of this eminent and learned body, I am quite grateful.

I come before you to make a few remarks upon this occasion, not by virtue of my being a foreigner, but because I am an experimenter, to some extent, in the field of electro-chemistry. Dr. Palmer I understand to be the first gentleman, on this side of the water, to call attention to this important subject. I can not and do not pretend to speak with regard to the practical bearing of this subject. That must be left to older gentleman than myself. Many of you gentlemen may not be aware that this subject of electro-chemistry has already attracted a prominent member of the dental profession. The gentlemen to whom I refer is Prof. Bridgeman, now, I fear, dead,

but whose works may be found in the third volume of the transactions of the Odontological Society, of London. In that volume you will find a brief essay, published some twelve years ago, which attributes dental caries to electrical and voltaic action. I will not attempt either to explain or refute his theory.

I have demonstrated that tin is in a negative condition in relation to dentine, when it is put in the mouth, but gold is also negative, and in a much higher degree. Dr. Palmer has proved in his experiments, that tin, in an electro-chemical point of view, is superior to gold as a filling material, but it has the practical disadvantage of softness of texture, and also a quality which, in the hands of unscrupulous dentists, is against it, viz: cheapness.

[The speaker then described some experiments in which he had been engaged, with the object of ascertaining the galvanic action between dentine and filling materials, the results being in general in keeping with Dr. Palmer's experiments. The remarks were highly technical, and being largely illustrated upon the black-board, an intelligible report is impossible. —Reporter.]

Dr. Flagg: As to Dr. Palmer's paper, I will say that I never approached any subject, in connection with dentistry, which has impressed me with such a sense of importance as this of dental chemistry.

My sole object, during the progress of my professional career, has been the salvation of the natural teeth to my patients. In the pursuit of that object, I have broken down my health, and when restored, I have pursued the same object with unabated zeal; but my success has not been all that I could desire. There have been very few teeth presented to me which I have not made an effort to save, however far gone they may have appeared to be. Because I have attempted so much, and taken so broad a ground, my failures have been proportionately increased, and I have been met by the assertion that it was because I could not fill teeth.

Now, for the good of humanity, and for the purpose of saving teeth, I have endeavored to find out why my fillings in these poor, miserable teeth, good for nothing at all, except to the possessor, so constantly failed.

We find in the June Cosmos the following passages. The first is from a gentleman of unquestioned ability. He writes as follows: "I question if there are any in the profession who have not been convinced, notwithstanding the fact that gold, in some of its forms, is unquestionably the best substance known to science for filling cavities of decay in the human teeth, that gold has many serious objections to its general use—objections too well known to need more than passing notice. It can not but be clear to every thinking mind among us, that there must exist in nature's laboratory some-

where, a substance, or number of substances, which * * * * possess all the requisite qualities of gold, and yet would be free from many of the objectionable features of that metal. If this conclusion be correct, no one, I apprehend, will for a moment hesitate to acknowledge that it is the duty of every intelligent member of our specialty to do all that lies in his power to bring to light and usefulness some substance that can be well packed in a tithe of the time needed for a good gold filling." Here is the testimony of a gentleman whose ability is unquestioned, and no one will aver that he is not able to use gold to the best advantage.

For my part, I am not surprised at the way in which this subject is presented by Dr. Palmer, who is investigating in the line suggested by the writer I have just quoted. I am not surprised that it should be received rather indifferently. It is too deep and original a subject to acquire an immediate hold upon the interest of the profession; but the time will come when there will be many energetic investigators in this direction.

[The speaker then read several quotations from the Dental Cosmos, from articles written by Dr. M. H. Webb, Prof. H. S. Chase, W. H. Dwinelle, and others, going to show that in many cases it is impossible to preserve teeth with gold, on account of electro-chemical action between the gold and dentine. The speaker then continued:]

Now, in my opinion, no gentleman has a right to put forth such views as have been referred to here—one man saying he knows so and so, and another saying that he knows just the contrary. It is as absurd for a man to say that thousands of teeth have been filled with amalgam that ought to have been filled with gold, as it would be for me to say that thousands of teeth have been filled with gold that ought to have been filled with amalgam. With no personal motive whatever, but with a desire to settle conflicting opinions by unmistakable evidence of facts, I commenced the collection of what I call my "Rogue's gallery"—putting into bottles the beautiful, first-class gold fillings of celebrated fillers, which have lamentably failed, many of them in less than one year. These little bottles I have labelled, each with the name of the operator, the date of the introduction of the filling, the time it remained serviceable, and the nature of the tooth structure and cavity. I have done this with a view of ascertaining where gold will fail in spite of the best skill.

One of the nicest of those fillings my friend McDonnell took from a cavity with a hair-probe—picked it out utterly loose and good for nothing. Now, gentlemen, when I have seen teeth which could not be preserved by the best operator with gold,—seen gutta-percha substituted, and the filling stand well, I am by no means inclined to brand that article as an ephemeral filling.

DR. WEBB: It has been asserted that gold is "*a purely mechanical remedy*" for the prevention of a recurrence of decay, while the oxide formed from another metal, as in any amalgam, "turns the teeth to a dark color and checks caries." This "preservation" has been said to be "*chemical.*"

If carious dentine be properly and thoroughly removed, and every particle of disintegrated enamel be taken away from the margin of the cavity, and gold be properly prepared, introduced and impacted against every part of tooth structure involved, and without there having been the slightest movement of such gold, if the filling be then properly finished down to and polished with the surrounding enamel, there will then be no space for moisture. There can, therefore, be no chemical action and electric currents evolved thereby between gold and calcium. The only manner in which this can occur, is by disintegration at some point, or points around or about the margin of enamel against which the gold is impacted. If the operation has been properly performed, and the margins of enamel be free from contact with the adjoining tooth, and have been so manipulated as that it shall be cleansed by the action of saliva, such disintegration will not recur.

It is very difficult to thus perfectly perform operations in some instances and under some conditions.

Manipulative ability, merely, can not apply this "purely mechanical remedy." To accomplish all which I have just indicated—that almost any of the duties of the faithful and conscientious practitioner may be performed—it is necessary that one understand the anatomical, physiological and pathological conditions and relations; in a word, really first-class operations can not be performed without some such knowledge, as well as keen perception and the exercise of correct and efficient judgment.

The same care is required for the preservation of the teeth, by the arrestation of caries and prevention of its recurrence through filling of the cavity of decay with another material, as with gold, notwithstanding the assertion that an amalgamated mass chemically preserves the remaining structure. Oxidation can not take place where moisture can not reach; hence, where moisture is, there may not only be such oxidation, but also chemical action, evolution of electric currents, and disintegration and destruction of tissue, except in those instances where there is black decay—where "the salts formed by decomposition of the mineral portions of the teeth are insoluble, and become polarized in a negative position to the decomposing agent."

It seems fair to conclude that, in consideration of all this, none of the materials which have so far been used for the preservation of the teeth are equal to gold, even if, as has been asserted, it is "a purely mechanical remedy," in contradistinction to amalgam with its chemically preservative influence.

I, therefore, now, as ever, hold that if a fully qualified practitioner and capable operator desires to perform operations, and to preserve the teeth as perfectly as possible, he should, unless it be in very rare instances, make use of gold as a permanent filling, for the preservation of the valuable organs he is called upon to treat, and if he does not possess the ability (and such ability will always manifest itself—no amount of talking will cover over incapacity or incapability,) to perform operations as they should be, then, rather than attempt to save these organs by unskillfully and imperfectly inserting gold in cavities of decay, one should make use of some material which, because of its plasticity, may enable him to more perfectly perform the operation—it being decidedly better to insert amalgam than to extract a tooth which the operator may thus restore, or partially restore, to usefulness.

Failure in dental operations is attributable, in the majority of instances at least, to the very imperfect manner in which such operations are performed, and all this should be duly and honestly considered and acknowledged before attributing the cause of failure to the action of acids and electric currents evolved from chemical action.

Dr. S. B. Palmer: In a paper which was recently read before the New York State Dental Society, there is this assertion: that probably in the hands of a first-class operator, 95 per cent. of teeth may be preserved with gold. I think that that is giving a fair chance to those who claim that they can save nearly all teeth with gold; but with an ordinary operator there may not be more than 50 per cent. thus saved.

I agree with Dr. Webb that these failures, in a great measure, are due to imperfect operations, either from inaccessibility of the cavity, or imperfect contact of the gold against the dentine; but if a gold filling fails in the hands of a practitioner of average respectability in certain cavities and certain teeth, it reduces that tooth to the second class of teeth, viz: those which must be saved by some other agency than gold.

I will answer the question, so pointedly put by Dr. Smith, in regard to the action of amalgam, and I will include any of the metallic fillings subject to oxydation—wherein it differs in preservative action from gold. I will use a figure which it seems ought to be plain to all of you. We will imagine a cup containing a solution of sulphide of copper, in which there is a copper plate and a zinc plate immersed. The action is rapid—there is a current evolved for a time, and very soon the precipitate of copper upon the zinc polarizes, and they are restored in harmony with each other, and the action ceases. It becomes corroded, or polarized, or reduced to the same electrical condition as that of the negative. The negative and the positive have reached the same electrical condition. Now, in the introduction of a tin or amalgam filling, which is properly inserted, and which

does not shrink, the tooth is preserved as perfectly as it can be by a gold filling. As has been remarked here by Dr. Webb, where there is no moisture, there is no action, but you can not rely on the mechanical perfection of a filling.

There is a need for something better than we have. Sulphide of silver—the oxydation from this plug entering into the dental tubuli—exerts a preservative influence and neutralizes the destructive action. For the same principle the zinc plate was rendered equal to the copper plate and neutralized the action between the two, and thus you have a preserving property.

REPORT ON THERAPEUTICS.

By C. A. BRACKETT, of the committee.

Therapeutics is not a brilliant subject. The work of medication, as compared with surgical and mechanical practice, is slow and indefinite—it may be intangible and unsatisfactory. Hence it is that by the average practitioner, and by the average patient, *impatient* for results, it has not been so much thought of as fine operations and well arranged dentures. Until within quite recent years, the subject has held only a very subordinate position in dental education; and the training of many men now in practice has not included that thorough study of principles upon which all intelligent therapeutical practice must be based. It is not too much to say that much of the dental medication of the past has been empirical; and the practice of the present is not entirely free from the same charge.

It is apparent, however, that each succeeding year makes steps of progress toward more careful, discriminating medication. Practitioners generally are putting more thought into their treatment of the lesions that come within their province, and intelligent patients are appreciating it. So far as has come within the cognizance of the New England member of your committee, the progress of the past year in dental therapeutics has been, not so much in the introduction of new remedies, or in revolutionized methods of practice, as in a more consistent, considerate and reasonable application and administration of healing agencies. A better knowledge of anatomy, histology, physiology, chemistry, and the principles of surgery, of pathology, etiology, and symtomatology, has led inevitably to a better practice of therapeutics. Practitioners now, instead of making one remedy, or one system of treatment, from a limited list of medicines, do duty for all the lesions coming under the same general class, are with greater breadth of view, considering the almost infinite variety of conditions, individual

peculiarities, stages of progress of disease, and other circumstances affecting the indications, and are choosing from the entire range of the materia medica such agencies as in the present state of our knowledge appear best suited to the special case and condition in hand. In dental therapeutics, as has been forcibly expressed concerning excellence in another field, the use of brains is the most important thing, and that element is being more and more exercised by the progressive practitioner of to-day.

It is not the plan, and hardly the place, of this member of your committee, to go very much into detail. Allusion is briefly made to only a few points. Perhaps in no branch of therapeutics has there been more activity and interest during the past year than in prophylactics. The large percentage of the present generation with teeth of soft texture and crowded, irregular arrangement, has led to much deep thought concerning the causes of those defects, and the possible means to be adopted for the prevention of the further operation of those causes in the cases of the individuals themselves, and also the next and succeeding generations. The concurring testimony of most careful observers is, that probably one cause of the condition of things just stated, may be found in the deficient supply during development of those elements upon which the bones and teeth depend for their hardness and integrity. Acting upon this idea, some practitioners have endeavored to supply the deficiency by a course of diet rich in lime salts, or by the administration of some chemical preparation of the same materials in assimilative form. Perhaps this plan has not yet been sufficiently tested for us to know that it will always be followed by definite beneficial results. The theory appears very reasonable, and very gratifying effects have been obtained in some instances. Prof. L. D. Shepard, of Boston, reported such a case at a meeting of the New York Odontological Society, in December, 1875*.

It seems, however, to be a principle in this method of treatment, that the earlier in the life of an individual it is adopted, the more effectual it will be. Your committee does not understand that there is very much hope of improving the texture of the dental tissues of a patient in adult life. It is thought that quite as much can be done in the way of favoring a strong dental development, through the system of the mother, while the child is yet *in utero* and during lactation, as at any subsequent interval.

Another condition of things that dentists are more and more feeling the necessity of combatting, is acidity of the fluids with which the teeth are bathed. Carefully conducted tests, instituted during the past year, in a series of mouths, have shown that a strictly normal condition of the oral fluids is met with only exceptionally, while acid mouths appear as the rule. With the corrosive effects of this acidity when present in any marked de-

*Trans. N. Y. Odont. Soc., 1875, p. 9.

gree, we are only too familiar, and we recognize it as a statement of truth, that no dentist who employs only mechanical means in combatting these ravages, is doing his full duty by his patients.

In medication for this trouble, antacids are used, both locally and systemically, and all influences tending to give tone to the system and improve the general health, should be brought to bear. Perhaps, as special practitioners, we need to have emphasized the principle, that very little progress can be made in the local treatment of lesions dependent upon systemic conditions.

Dentists are instructing their patients concerning the valuable hygienic influences upon the teeth and their investments, of legitimate exercise. The mastication of hard and tough food assuredly contributes to health of the gums, and increased density and resistive power in the teeth. Such exercise is well supplemented by the judicious use of the brush.

One other point in proplyactics has reference to a means that has been suggested for the prevention of sensitiveness and its sometimes serious *sequelæ* following the introduction of a metallic filling. In an article, entitled "Gold in Teeth," by Dr. E. W. Foster, then of Milwaukee, published in the Cosmos, of March, 1873, Vol. XV, p. 136, allusion was made to the hyperphosphite of lime as being most happily adapted to secure the object mentioned at the head of this paragraph. At a meeting of the American Academy of Dental Science, held in Boston in May last, Dr. Foster presented a more elaborate paper on hyperphosphite of lime, testifying that three years additional experience had only confirmed the favorable views concerning it, expressed in the former paper. The theory and details of its use are better gathered from Dr. Foster's own writings, than from any attempted *resume* of them here. This member of your committee, however, desires to state that in a limited three months use of the material, it appears to possess many of the advantages claimed for it by the gentleman who has brought it to the notice of the profession.

As a whole, the tendency of therapeutical thought and practice in New England evinces a disposition to take advantage of all attainable sources of knowledge and means of improvement, and to make that knowledge subserve the comfort, health and best interests of patients and humanity at large.

REPORT

ON

DENTAL THERAPEUTICS.

By W. H. ATKINSON, of the committee.

A report on therapeutics, to be satisfactory, must be approximately complete.

Any thing like a complete history of the conception of the necessity of therapia, and the slow aggregation of the facts pertaining thereto, demands a review of the rise and progress of all that is included in recorded medical knowledge, and in the face of these statements, the magnitude of the task, and the impossibility of its ready accomplishment, will be apparent to all.

Had the appointing power given indications how to treat the subject, and to what extent to pursue it, I would be less embarrassed in the undertaking.

Therapeutics can not be said to be an exact science, although each limb of every proposition pertaining thereto has its root and its explanation based upon the same common foundation with mathematics, music and astronomy.

Long before anatomy was known, physiology revealed, or pathology concieved, in anything like a connected series of perceptions of body function and perversion of function, there were those who were inspired to assume the conduct of diseases of the human body and mind; and every addition to therapeutics, from that day to this, has been an assumption of a revelation, or a real revealment; therefore, all the laws of human anatomy and of human physiology, must be understood to enable one to assert

that the organs are in place and the functions normal; all of which is but the foundation of the standard of perfection of body and function, any perversion of which will constitute the beginning of disease, or pathological manifestation.

Any thing that will remove the perversion in body or function, is an example of therapeutic agency. The persistency of type of form and function are necessary elements in the diagnosis of aberrations in either.

It may be well questioned whether there is any exact standard of the measures of specific body and function yet revealed sufficiently plain to be definitely formulated; therefore, therapeutical science as formulated, only approximates to scientific certitude.

Each individual, being the offspring of diverse convergent lines of ancestral endowment, that may be favored or hindered by the surrounding circumstances and culture of growth and education, it becomes necessary to comprehend all these ancestral impulses and their possibilities, to enable us to lay out the probable career of the individual in question.

At one time, each human being is potentially and actually a part of two diversely endowed secretory apparatuses, denominated father and mother. The confluence of these two products of secretion constitutes the inception of a new career, as resultant equation of the plus quantity of mass and energy of the parent stocks. This point of confluence of the two *semens* is the point of inception of individual career. The product of this confluence is denominated a germ, and all the changes that follow during the entire life or career of the body in after life is but the *evolution* and practicalization of the potentialities *involved* at the time of the mutual impregnation of the two semens, or the production of this germ.

I said that the production of this germ was an equation of diverse hemispheres of mass and energy. A further explanation of what I mean by equation is necessary, to enable us to account for the predominance of paternal and maternal characteristics in the offspring.

The paternal hemisphere may stand in the relation of a dyad, (that is, a body with two acting measures of affinity) to a maternal hemisphere of two monads, (bodies with one acting measure of affinity,) and thus effect the equation of measure of bonds, with diverse number of elements composing the new body; or this power of endowment may be reversed, and the father provide the two monads and the mother the one dyad. This reversal of order of bonds of endowment may be supposed to be accepted under stress of circumstances, in preference to a failure to accomplish impregnation.

Albeit, the normal confluence would be effected in fullest measure of equation in its true sense, by the combination of molecules equally endowed in number of acting bonds of affinity.

Probably this last is the only example of a true, physiologically endowed offspring.

Many boys take after their mothers during infancy, youth and adolescence, after which they gradually simulate their fathers in maturity and advanced years.

In the first instance their constitutions demand a treatment similar to that adapted to their mothers; in the second instance, a treatment adapted to their father's, will be demanded.

Disease is imperfectly performed functional activity, therefore the simplest example of disease is a minor expression of function.

The energy that brings the functional tension to the normal standard, is the first example of the presence of therapeutic agency.

It thus appears that therapia depends upon the law of demand and supply of measure of affinity requisite to the formation of the factors of function of the human body, in general in the organs, and specially in the elements of the organs.

Immediate influx of energy is immediate cure of debility. *Mediate* influx is mediate restoration, *intermediate* influx the example of intermediate curative activity.

These are all examples of supply of needed energy requisite to the performance of function.

The example of immediate satisfaction of demand occurs spontaneously, in fields where similarity of tension of dynamic and static bonds of affinity are present.

Mediate energy is the resultant of union of tensions out of harmony to the needy territory, becoming compatible through confluence of the incompatible separate bonds, which confluence is the mediator that renders these bonds compatible and appropriable to the territory demanding the supply of energy.

Intermediate energy is that form of functioning power, that is produced by incrematory processes, few or many, to attenuate its bonds of affinity and attune it in dynamic tension to the point to be supplied.

Generation of tissues depends upon reciprocal interpenetration, or satisfaction of bonds, or measures of power to unite, occurring in the elements or units of tissues.

Maintenance of tissues consists in the feeding of these units.

Reproduction of tissues follows the formulæ of the process of production of tissues, by the conversion of pabulum into cells, and cells into tissues.

That example of reproduction of tissues which I have denominated

maintenance of tissues, may be said to consist in a regular advent and transit of cells along the line of the fibre of the tissues, the cell or corpuscle converting pabulum into the substance of its own body, by a process of cell-feeding analagous to breathing; that is, by taking in the pabulum endosmotically, and placing it where needed in the body of the cell and its processes, and removing the worn out and dissociated pabulum by an exosmotic expiratory movement.

This process of cell-feeding favors the progression of the cell as an element of the tissue, from the base of the filament along the line of its fibre towards the peripheral extremity, whence it is shed as an epithelial cell in secretions, excretions and desquamations, so soon as it ceases to be capable of further appropriation of pabulum.

In case of considerable loss of tissue by mechanical violence, another form of reproduction of tissues presents itself, strictly analagous to the process of original generation. That is to say, a pocket must be secured in the surrounding parts to hold the protoplasm out of which to construct, by a regenerative process, the tissues of replacement. This pocket stands for uterus; the exuded protoplasm for liquor amnii, into which the new blood-tracts from the adjoining capillaries project themselves to construct the tissues of replacement, according to embryological transitions of alternation of the deciduous or preparatory stages, into simple blood tracts or sinuses convert into capillaries venioles, and arterioles, and thus lay the machinery for bringing the elements to the territory, wherewith to construct the tissues according to the original type.

Exsected nerves and bones are capable of this kind of replacement or regeneration, (where the necessary pockets are secured), so exactly like the original structures as to elude detection.

If we attempt to sift the essential and useful from the non-essential and hurtful, in the fields of therapentical investigation, we must be willing to take a step at a time, go slowly, observe closely, and decide cautiously, in accordance with the stage of our progress, in the attempt to understand what constitutes health, disease and cure, in whatever particular case may be the object of study.

Health is the exercise of full measure of function. Disease is some interruption or minification of this harmonial expression.

It may then well be asked, "Have we any such example of exercise of function among men?"

To understand the full measure of health, it is important to know in what the measure consists, and my reply to that question is, ", "It depends upon the degree of satisfaction of desire being complete, when expressed among atoms, molecules, cells, tissues, organs and bodies composed of organs, in which the interchanges consist of amplifications and minifica-

tions of combinations and separations upon a scale or series of bonds sevenfold in degree.

To understand the physiological expression of the molecular metamorphosis of the human body, the disturbances of which call for therapia, it becomes necessary for us to understand not only the mass presentation of harmonial and inharmonial function, but also to analyze it by tracing it to its elemental expressions, to do which it becomes necessary to unravel the modes of biological and chemical metamorphoses, as the series of steps of one category instead of as heretofore, ignoring chemistry in biology and biology in chemistry.

Molecular metamorphosis is claimed to be primary biological activity, whilst chemical activity is claimed to be a motion without life, the stupidity of which will be made apparent by any well-conducted chemical investigation.

Let us see: Chemistry does not presume to account for the existence of atoms, but busies itself with the association and dissociation of these elemental bodies. Most of their behavior in combination and separation has been made known to us by the empirical and so-called accidental experiments of the laboratory.

To such extent has this prevailed, that it is regarded as unsafe to form an opinion of how any two or more bodies will behave, when placed in hitherto untried relations, and chemical affinities are said to be known solely by the crucial test of experimentation.

Let us take the example of nitrogen and oxygen and see if their behavior, under the circumstances, does not reveal to us the fact that they have both intelligence and volition, the satisfaction of which in their various measures generates the diverse bodies, that we call nitrous oxide, nitric oxide, nitrous acid, hypo-nitric acid and nitric acid, differing in capability of action upon the human body, all the way from a respirable inoccuous gas to the terribly escharotic and destructive dense liquid, known as nitric acid or "aqua fortis."

Let us now ask, "What constitutes the difference between these various bodies?" and learn that it is the mutual reciprocation of bonds or units of energy, being satisfied or saturated in what is called "saturation of these bonds."

What are the circumstances necessary to the combination of these atoms by which the new bodies, known as molecules, are generated? Nearness, "within the sphere of influence," and a current of energy, known as the electric current, discharged from the positive to the negative pole, are the necessary conditions for the metamorphosis of the atoms into molecules.

This current stands as high-priest to awaken and justify in marriage the

hitherto potential, now active, measures of energy, through the exercise of which energy, the diverse atoms, are metamorphosed into the new body.

This is true in the simplest as well as the most complicated example of metamorphosis in all three kingdoms—mineral, vegetable and animal.

The awakening of energy must be complete, to secure completeness of its exercise in the formation of the new body. It will, therefore, be manifest that when the awakening is but partial, the body produced will be short of a standard measure of energy in functional activity, in the ratio of the minification of the awakened activity.

That we may have some adequate conception of the great variety of potential bonds to be awakened and joined, to secure human protoplasm with full measure of endowment of psychical and physical capability in the effected product, as presented in the complete human adult, male and female, as elaborators of this wonderful dual seminal presence, through which alone the human type is continued, we must remember that the metamorphoses of profit and loss of mass and energy belonging to the mineral and vegetable kingdoms were the necessary steps to produce the amplification and the refinement of molecular metamorphosis, the values of all of which are potentially held in animal protoplasm, the most refined example of which is the human protoplasm as presented in the vivified germ from which the new being arises.

To the end that we may be able to recognize physiological and pathological activities as the foundation of disease and the cure thereof, I am constrained to present a tabulation of physiological developmental processes as wrought out and arranged by Wm. Fishbough, which he names "Pantagram of Developmental Biology," and kindly consents that I should copy and use in this relation.

Mass and energy, or matter and spirit, are the factors of protoplasm, any separate naked portion of which may be regarded as potentially holding and actually operating the seven modes of function, or materialization of spirit in factors of function in :

1st—Dermal, or limitory and protective function.
2nd—Nutritive, or supporting function.
3rd—Respiratory, or breathing function.
4th—Cardiac, or circulatory function.
5th—Moto-sentient, or innervating function.
6th—Histo-organic, body or anatomical form.
7th—Reproductive, or generative function.

This first protoplasmic monad, or amœba, without differential organs, as factors of differential function, may be said to be alternately omni—dermal, (all skin), omni-stomatic, (all mouth), omni-spiracular, (all spir-

acle or breathing hole), omni-cardiac, (all heart), omni-neural, (all nerve), omni-organic, (all organs), omni-genital, (all generative, any portion being endowed with the capacities of the whole as organic individual), thus presenting us with the actual functions of the human body, without displaying to sight the special machinery of the perfectly differentiated human body, the differentiations of which grow out of the demand for the special function to be operated by special organ, which constitutes the freedom and coincidence of all these in their perfected presentment in the human mind and body, as the crowning excellence of biological manifestation.

All efforts to understand and formulate the processes of production and differentiation of factors of function, result in some sort of classification to mark the modes of dynamic embodiment of energy in mass, or spirit in matter, the differences of form of body being dictated by the use to which they are to be put, whether that use be special or general, which can alone be proved by minute observation of the career of each.

That is to say, that any number of naked portions of protoplasm being brought together, will coalesce into one homogeneous mass without differentiation, but when any portion of protoplasm becomes enclosed within a limitary membrane, it may be converted into neural, connective, glanular, muscular, or osteal primates of tissue, according to the position of its limitation, in agreement to the type of the body to which it belongs, and this type can only be known by its agreements with the adults from which it was obtained.

That is to say, that the human embryo being an undifferentiated amœba, must pass through all the degrees of the invertebrata, or mollusca, vertebrata and mammalia, to the bimana or fully enfranchised genus and species homo, to present us with the culmination of functions of mind and body in the unitary type of completeness of the whole in MAN.

The deterioration of any function, or factor of function, is properly a sickening process. Any application of energy or mode of energy by which the deterioration or sickening is overcome or removed, is properly a curative or therapeutic agent, whether that be dynamic, psychic, chemical or mechanical in character.

Cure, then, consists in restoring to soundness of the function and of the part, in other words, of destroying and removing abnormal functions and abnormal growths, that the physiological energies may hold normal sway in the production and maintenance of the growth to ripeness, and shedding, in serial order, of the elements of the tissues and organs, to maintain their integrity as essential parts of the physiological machinery.

In making application of therapeutical agencies to the human body, we should bear in mind the sources whence we derive our "armamentarium," or means of cure.

These are divisible into immediate, mediate, and intermediate examples of presentment of energy, and are variously derived from the animal, vegetable and mineral kingdoms, and all depend upon measures of energy, or dynamics, for their ability to effect their purpose.

All new bodies and all new processes arise in an occult and intangible presence, that gradually becomes perceptible and tangible to our means of observation; that is to say, all solids pass through the various stages of vaporous, liquid, colloid and solid forms of presentment, by which we know and classify them by predominance of these qualities.

Predominance of crystalline character marks the mineral kingdom; predominance of cellular character marks the vegetable kingdom; whilst predominance of colloidal, or soft-solid bodies, is the characteristic sign of the animal kingdom.

It will thus be seen that the mineral kingdom solidifies by simple accretion; that the vegetable kingdom is formulated upon cellulation and accretion; and the animal body is formed and sustained by corpusculation, cellulation and accretion in alternations of predominance.

Therapeutists advocate a very wide range of therapia, from the sheerest "expetante," watch and wait system, to the most pronounced and heroic depletion by bleeding, emesis, catharsis and diaphoresis, "ad deliquium animi," each advocating his own view strenuously, to the exclusion of all others, thus befogging the unlearned and begetting disgust or indifference, which prevents the elaboration and demonstration of the true inclusive, general system of therapia, that investigates every fact and relegates it to its proper place.

The poly-pharmacists advocate a great variety of articles combined in one prescription as a single remedy, while the uni-pharmacists, their opponents, deny the possibility of arriving at certainty of cure by this means.

Those who expect to understand all the changes that take place between the medicines administered and the nutritional changes that follow, will have a difficult task to justify their expectations, in proportion to the number of articles that enter into the remedies they use.

There is one point in therapeutics too little regarded by those who write upon the subject. I refer to what is known as personal compatibility and incompatibility of medicines, or idiosyncrasy of patient to physician and to remedy; that is to say, the same prescription given by different physicians will not be followed by like results. There seems to be something in the personality of him who prescribes, that goes with the medicine to cause it to accomplish the goodness of his intention.

This goodness of intention or desire to be of service to the sufferer, is the directive agency through which the potentiality of all remedies expresses itself in the solutions and resolutions that constitute the cure.

Were this not so, as an emanation from an individual personality, all remedies would operate uniformly in the cases to which they were applied,

Not until we shall have had a new deal in the classification of therapeutics, will it be possible for us to be efficient in practice by merely following out the formulæ most accepted among the learned in such matters.

When that new and comprehensive system of therapia makes its appearance, it will dissipate the dense atmosphere of narrow selfishness that envelopes each special system of therapia, and enable therapeutists in general to reject the irrelevant and utilize the relevant in each special case without the prejudices pertaining to a partial culture.

DISCUSSIONS.

DR. BARKER: I must say that I was somewhat disappointed in the statement made in the first paper that was read, that but little progress had been made in the department of dental surgery within the past year. This indicates, it seems to me, a rather narrow view on the part of the author. During the past year we have had several valuable therapeutic agents brought to light, and experiments have been made rendering their advantageous properties somewhat familiar. It seems to me that the paper has ignored a very authoritative essay published some years ago in the Dental Times, upon the sulphites and hypo-sulphites. Since that time I have used these compounds with considerable success, particularly in the treatment of cases where I wanted to remedy certain peculiar conditions always present in cases of retrograde metamorphosis.

I also want to call attention to another agent, which has been used considerably in dental practice during the past year, viz: salycilic acid. This agent has been found to be decidedly advantageous in certain pathological conditions. It is not supposed that it will take the place of creosote or carbolic acid to any great extent; yet, at the same time, it has valuable

uses. An eminent gentleman, well known to all of you, said that in obtaining that agent, it seemed as if we had got the very "spirit" of carbolic acid. But it has disappointed me in some respects, although I have found it very advantageous in certain conditions of the oral cavity.

Dr. Atkinson: I did not intend to occupy further the time of this body. I am not willing, however, that this subject should pass without making some effort to justify the course I have taken. I am aware that it is new; I am aware that it is not merely passing over the old hum-drum methods, but I have laid bare the system of function, the aberration of which requires the application of a remedy.

I had intended to take advantage of the opportunity to state that the seat of nutrient activity must be the seat of repair, and that the seat is in the cells, though not in the cells as cells *per se*. The cells themselves are made up of condensed protoplasm in which the function takes place, and operates all the changes of healty and unhealthy nutrition. Now, what is the action of any food, any poison, or remedy—for any substance capable of acting upon the body may hold the relation of food, poison, or remedy, to that body, in accordance with the state that that body is in, and when I say "that body," I mean the cell and its granulous constituents, taking it as something which is made up of multiplicity. The currents and movements of what has been called by the last speaker, "retrograde metamorphosis," take place within the cells of the human body. I made the statement that nutrition, the appropriation of either food or medicine, was an act of imbibition by the law of endosmose; but when the substance that constitutes the remedy is in the body of the cell proper, a change takes place in it, and it would be folly for me to give to you the crude apprehensions that I have about it.

A Member: Has not every physiologist taken that position?

Dr. Atkinson: I think not. I assert that, so far as I am aware, secretion and excretion have never been pronounced to be moulting acts, except by myself—acts of moulting epithelion. Where the fluid produced by the cell is to be used again in the system, it is called secretion, when otherwise, it is called excretion; but the act is the same. That is to say, it is operated by the same machinery.

I have read almost all the books, and I have observed that they always halt half-way in explaining the laws of nutrient activity. They do not strike "hard-pan." That is the reason I am in earnest. All tissues have to be fed, but you can not feed a tissue with an insoluble substance. The only way that a tissue can be affected by an insoluble substance is by what has been called the action of presence, or catalytic action, and this is unex-

plicable, unless you acknowledge an unseen action called spirit. We all know that certain mental conditions excite to action certain of the secretory organs. That is what I call dynamic or catalytic action.

Dr. Barker: So far as I am able to understand the gentleman who has just resumed his seat, I must beg leave to differ with him, and I wish to put pathologists, so far as I have read them, right upon the record.

It is usually asserted that cell action occurs upon the application or administration of medicines, and that in that act of passage of substances through the cell walls, a change takes place, which we can not at present understand—which is nothing new, and to that part of it, I desire to say, Dr. A. has no claim whatever as the authorship of the idea.

The paper read said but little on the subject of epethelial changes. Indeed, I believe, it took the position that but little could be hoped for in the way of change in the tissues after birth—in the dental structure, if you please.

I desire to place myself upon the record as distinctly opposed to that theory.

A Member: It was after adult age.

Dr. Barker: Well, I maintain that by using the proper substances, under favorable circumstances, and some times under unfavorable circumstances, we may hope for good results. I will here mention a case which I have now under treatment, illustrative of that point. A young lady, just previous to marriage, came to my office and had her mouth thoroughly examined. I found her teeth in perfect order, with no cavities of decay. She married, and about a year afterwards gave birth to a child. A few months after the birth of the first child, she again became *enciente*, and the physician allowed her to continue the process of lactation nearly up to the birth of the second child. Some few months after the birth of her second child, she came into my office, and I found the fillings in her teeth in such a condition that I could remove them with a hair-probe, and I found that I could take an excavator and cut the teeth anywhere, almost as I would cut cheese.

Now, what was I to do? The patient was in a very fair state of health, and I concluded, after a careful consideration of the matter, that I should be doing that patient an injury if I performed for her any service but that of a temporary character. Therefore, I relied wholly upon Hill's stopping, and waited for time to consolidate and improve the tooth structure, which I felt certain it would, under proper treatment. I made use of the lacto-phosphate of lime, one of the best agents I know of in such cases. I prescribed three tablespoonfuls daily. This treatment has now continued for some time, and I find a marked improvement in those teeth.

In view of this case alone, I think the paper takes a very unjust position when it asserts that we can not improve tooth structure by treatment. We all know that consolidation of tissues and dental structure takes place after adult life. We find a marked change—the teeth growing harder as men grow older, just as other tissues change. In youth the balance is in favor of supply. In middle life the balance is perfect. As we advance in age we have consolidation of structure, and the balance is in favor of waste.

Dr. Dixon: I wish to subscribe heartily to what Dr. Barker has said in reference to changes taking place after adult life.

I think one of the duties most incumbent upon dentists is to observe the changes which occur, not only soon after adult life, but all through life. I could instance some cases of this kind, which would startle men who never considered this subject. I have made it a point to consider it through my professional career, and the more I have considered it the more I am convinced that these changes take place at all periods of life, and sometimes with a startling rapidity. Teeth which at one period of life I have found solid and enduring, within three months of that time I have found to succumb to decay. This is something which ought not to be and cannot be ignored by dental practitioners.

Dr. Barker: Have you had any experience in hypo-phosphites?

Dr. Dixon: No, sir, not sufficient to make it instructive or interesting to this body.

Dr. J. S. Smith (Columbia, Pa.): I think the proper understanding and development of this subject of therapeutics will, at no distant day, have a marked influence in perfecting a better natural denture than we have at present.

Through systematic treatment by therapeutic agents, it is possible that the future dentist may be able most successfully to deal with degeneration in dental tissue. In fact, there are those now, in the infancy of our profession almost, who are employing therapeutic agencies with this end in view. It is becoming quite general now to prescribe lacto-phosphate of lime to the prospective mother. This is done, as I understand it, with a two-fold purpose: that of building up pabulum in both mother and child. It requires time, however, to build up an improved tissue; therefore, success must not be looked for too speedily.

When a person is treated by a physician for softening of the bones, the usual remedy is bone phosphates, and in due time nutrition takes place, and there is a restoration of what has been broken down through hereditary or natural causes.

There is another very valuable therapeutic agent which has not been mentioned here: common lime water. It may be taken with milk, and be readily assimilated by the system.

Dr. Dean: It may be well known to this body that arsenic has, of late, received a good deal of attention, not only in this country, but abroad, as an antiseptic. I have noticed in the discussions of the Odontological Society, of N. Y., some remarks by Prof. Flagg, that surprised me much, because I had supposed that arsenic did not possess the properties which he ascribed to it. A number of years ago I took a quantity of fresh veal, and cut off a piece perhaps a quarter of an inch in diameter, placed it in a bottle and covered it with white arsenic freely. Some ten days after, it became very offensive from putrefaction. About the same time, I took a piece of similar size, placed it in a bottle, and covered it with glycerine. The result was that the one to which the arsenic was applied became very offensive, while the other seemed to be free from putrefaction. I then took three pigeons. To one of these I gave two grains of arsenic internally. To another I gave four grains. The one to which I gave four grains died in about eight or ten hours; the one to which I gave two grains lived a little longer. I then killed the other pigeon, and sent them all into the country, where they were hung up in a shed, so as not to be exposed to the sun or rain. The one free from arsenic showed no signs of putrefaction for about six days, but on the seventh day gave evidence of decomposition. The others stood it out for three or four days and then succumbed.

Not being familiar with frog experimentation, I got another gentleman to experiment on a couple of frogs. He took two grains of arsenic and rubbed it on the inside of the thighs of one of these frogs. Two days afterwards he inserted one grain of arsenic into its thigh, which he bound up, and four days afterwards he stripped out the foot and placed a grain of arsenic on the web. This frog lived about six days. After he died, the Dr. took one of his thighs and had it subjected to analysis. No arsenic was found in the thigh of the frog. The other thigh was placed in a shady place, and it became so offensive that he was obliged to throw it away in about twenty-four hours.

The other experiment was with a frog, where the arsenic was administered internally. This frog was given two grains of arsenic at the first dose, and two days afterwards one more grain of arsenic was given, and about four days afterwards we gave him Fowler's solution. On the sixth day the frog yielded to these remedies.

I was mistaken in what I said in regard to the leg of the other frog. It was not submitted to analysis, but in the viscera of that frog—the one to which the arsenic was applied externally—there were found crystals of

arsenic, but the viscera from which this arsenic was obtained became very offensive from decomposition, in the course of twenty-four or thirty-six hours. The frog, when the legs and viscera were removed, being placed on the ledge of a window having a southern aspect, dried up in a few days, without any signs of putrefaction. The other frog was placed on a window sill with his viscera in him, and he also dried up without any signs of putrefaction.

Dr. Hunt: I am very glad that Prof. Barker has started the question of the waste and repair of teeth.

I wish to speak particularly with reference to the therapeutic agents we use. Prof. Barker mentioned lacto-phosphate of lime. That is probably one of the best forms in which we can get the material. With our present knowledge of chemistry we can not, in the laboratory, place any article of food or any article of therapeutics in a proper and perfect condition for assimilation into the human body. The only way in which we can get these ant-acid therapeutic agents, which are taken internally and act through the circulation in a perfectly assimilable condition, is to have them first passed through the laboratory of nature before we use them. And in the use of our therapentic agents, if we will direct our attention to bringing them into that condition which is most closely allied to the products of nature, either in the vegetable or animal kingdom, the more nearly will we attain success in their use. If we desire to arrive at correct conclusions we must follow out the process from effect to cause.

Dr. Flagg has been referred to as taking a certain position, which I think is not thoroughly understood by this body, and as he is not here, I am willing to speak for him as best I can. The position he assumes is this: that in the application of arsenic it is not imperative to remove it at any given time, for fear of having absorption ensue. It may be left indefinitely, without giving any systemic or local disturbance. If a certain amount of arsenic is absorbed, for instance, into the pulp by endosmosis, and acts on the cells there exclusively, it has only a local influence. I think myself that it does act systemically.

A Member: How about preserving frogs?

Dr. Hunt: The taxidermists use arsenic extensively in the preparation of birds, and the object is this: to secure a union of the arsenic (perhaps not a chemical union) with the tissues of the body; but we all know that arsenic, when administered in certain forms, locally, does seem to act locally. Quacks in our part of the country frequently advertise to cure cancer without the application of a knife, and they use for this purpose what we call arsenical paste. We have in such cases the best evidence that

such an application is merely local. Its influence is systemic only when a moderate quantity is applied; in other words, it is perfectly safe to make an application of fifteen or twenty grains locally, when one or two grains similarly applied would produce systemic action.

Dr. Kingsbury: It has been remarked that the waste and repair of the teeth is a mooted point. For my part I see no reason why it should not be regarded as a well established fact.

We know that the elements for the repair of broken down tissue are transported by the arterial circulation, while the worn-out elements are carried out and ejected from the system by means of the venous circulation. We know that the pulp of a tooth possesses arterial and venous circulation, and I see no reason why it should not be subject to the same processes as take place in regard to the general system.

Now, in regard to the best material for the repair of a deteriorated condition of the teeth. I had prepared, a number of years ago, a hypophosphite in the form of a syrup. I had it prepared to test its effect in improving the structure of teeth which seemed to be extremely deficient in lime salts. I administered it faithfully for quite a length of time, and I must confess that I came to the conclusion that the phosphates of lime in that form were not assimilable. The result disappointed me. I think those elements of food which tend most directly to build up the general system, are best adapted to improve the structural character of the teeth.

Dr. John Allen: I think that where we can employ therapeutic agents directly from nature's laboratory, we are more sure of good results than where we rely upon those substances from the laboratory of man. For example: in the diamond, a product of nature, we have absolutely pure carbon; but show me a man who can take pure carbon and reproduce a diamond. I am aware there are those who think they can supply the want of the phosphates of the food in other forms. I am quite positive, from experience and observation, that it is far better for us to rely upon natural substances than upon artificial compounds. For instance, let us take the phosphate of lime, just as nature produces it in the hull of the grain. I have far more confidence in such a method of practice than I have in the use of drugs.

REPORT

ON

MECHANICAL DENTISTRY.

BY W. N. MORRISON, CHAIRMAN.

As an individual member of your committee on mechanical dentistry, I beg leave to present the pinless porcelain tooth, the *exact* shape and size of nature's own productions, recently patented by Dr. Wm. P. Hall, of Piqua, Ohio. The specimens herewith presented will explain themselves, and every one will readily recognize that these shapes are what we have long and earnestly desired. We want teeth resembling nature, as much as can be produced, in shape, color, and *good masticating surfaces*, particularly in bicuspids and molars, whatever they may cost. Our object should not be to buy so many teeth for so much money, regardless of how well they may imitate nature's own productions or subserve the high offices of enunciation, mastication, etc.

There are some slight obstacles to be overcome by manufacturers in the production of these new shapes, particularly with regard to color; but we sincerely hope not more formidable than those in the production of the old specimens, with which we have so long compromised our professional and artistic dignity, thereby making every dentist ashamed to own that he pretended to be a mechanical dentist, or did artificial work of *any* kind.

From all that I have been able to learn, the relative value of the different bases remains in the same order as heretofore. They have been so ably reported upon by our erudite chairman of last year, that the west has nothing new on this subject to offer.

REPORT

ON

MECHANICAL DENTISTRY.

By W. C. BARRETT, of the Committee.

(CHEAP BASES FOR ARTIFICIAL TEETH.)

In the choice of the material for the base of an artificial denture, a number of things must be considered, not the least of which, in the estimation of the greater part of our people, is the cost. If in the absence of the natural teeth, artificial substitutes are a blessing, it should be our aim to place them within the reach of the laboring man, who must in this be governed by the laws which dominate him in supplying his other wants. If he cannot for the dress of his wife or daughters afford silk, he must perforce content himself with cotton. It is not perhaps as durable, or as ornamental as satin, but it has for him the allurement of being within his reach. It may not be charming, but it is cheap. In the choice of materials for his wife's or daughter's teeth, the same rule must govern his action. We are not all rich, nor can all dentists work for rich patients. The necessities of the poor are none the less imperious because of their poverty, but they call upon us for an effort to place indispensable things within their reach. Our most skillful and best appreciated dentists might, so far as their usefulness to the lower classes is concerned, as well be translated to another sphere. The calico dress of the artisan's wife is not the best kind of a dress, but it serves her necessities and covers her nakedness, while it is within the means of her husband. Some merchants, perhaps, keep no other goods than silks and satins and velvets, but for one such, there must be ten who deal mainly in ginghams and calicoes. The greater proportion of our people must con

fine themselves to necessities, and choose but the cheaper of indispensables. If we as a profession would fulfil our mission, we must recognize all the conditions, and strive to conform ourselves thereto.

There is, then, a demand for some cheap base for artificial teeth, that the wants of those whose necessities are as great, but whose ability to pay is more limited, may be supplied. Many efforts have been made to minister to this imperative demand. Various combinations of base metals, diverse compounds, and medleys of incongruous ingredients have been offered. Our hopes have been excited through impracticable metals, and by moonshine schemes to fabricate the finest silk purses from the commonest sow's ears. It was not till the advent of caoutchouc or rubber, that a step seemed to have been taken toward the desired end. But with even this material, it was soon found that the dental millennium had not been quite reached. Rubber was liable to certain objections inherent in the material itself. But though it did not promise to supply the demands of artistic dentistry, in the hands of competent men it has subserved a useful purpose. It is not silk, but it has been made to do very well as cotton. Unfortunately, its very cheapness and ease of manipulation, while putting artificial teeth within the reach of all, has also brought into dentistry an entirely new class of dentists, to supply the greatly increased demand. These new-fledged professional men, with their little carpet-bags, have perambulated the country in all directions, and carried their wares to every door. They have worked for a mere pittance, and their accomplishments have been confined to the wholesale extraction of natural teeth, and the insertion of poor artificial substitutes. While they have thus wrought much mischief, they have for all time established the certainty of cheap dentistry. However much we may deplore this, and sigh for the good old days of gold and high prices, we must accept the present condition of dentistry among the masses, and as true men—lovers of our profession and of mankind, endeavor to bring about a more healthy state of affairs.

Rubber has been enthroned as the modern Jack Cade—king of the mob. In the minds of many, it is not worthy this position. It has, like many another monarch, fallen completely under the influence and domination of its prime minister—Bacon—that power behind the throne, greater than the throne itself. So firmly has he entrenched himself, as to defy our utmost efforts for his dislodgement. By virtue of the tinsel crown and cheap prerogatives of the patented monarch, this wicked minister has seized upon and sequestered to himself all revenues. Most oppressive taxation has, without our consent, been levied upon us. The royal monopolies have become so great as to be intolerable. We have struggled to rid the cheap monarch of this malign influence, but to no purpose. We have petitioned, we have remonstrated in vain. "Our petitions have been slighted, our remonstrances have brought us additional insult and injury, and we have

been spurned with contempt from the foot of the throne." We have resisted taxation, and our goods have been seized upon in this mock king's name, and our estates have been sequestered. There remains then for us nothing but the dethronement of the monarch himself.

To drop the figure and descend from the realm of cheap rhetoric: In the selection of a cheap base, we should choose that which is liable to the fewest objections. For all practical purposes, there are but two to elect from—rubber, and its powerful rival, celluloid. Let us compare the one with the other, that we may the more intelligently select.

Organically, there is but little difference between them. Both are nearly related to protoplasmic matter, being severally but a single step removed from inorganism. The one is an exudation—a gum—the other the partially organized product of vegetable function—cellulose. In some of their characteristics they widely differ. Both maybe molded in a matrix; but the one is solidified, made stable by the application of caloric, while the other is rendered plastic by the same process. Of the method of the preparation or manipulation of either, it is unnecessary to speak. We will consider their various properties in their several relations to dentistry—their density, solidity, tenacity, weight, cleanliness, conductivity, ease of manipulation, adaptability, expense, destructibility, beauty, and congeniality.

In density, impenetrability, neither has much the advantage. There is an impression that celluloid is porous, and likely to absorb the fluids of the mouth; and as to much of the material furnished dentists, the objection is valid. But when this is the case, the fault is undoubtedly with the manufacturers.

In hardness, solidity, rubber is the superior.

In tenacity, strength, celluloid has considerably the advantage. This is an important qualification, and is amply proved, not only by mechanical tests, but by the manner in which the material resists even change of form. Superadded to its superior tenacity, is its greater elasticity.

Rubber is the heavier of the two. This is sometimes an advantage, and at other times an objection.

In cleanliness, there is little to choose between them. Both being molded about the teeth, and neither, when properly manipulated, being greatly liable to shrink or draw from them, there is very little opportunity for the deposit of matter which can not be readily removed. Their powers for transmitting caloric are nearly equal. Both are poor conductors, and herein lies one of the chief objections to the use of either.

In ease and pleasantness of manipulation, celluloid has considerable advantage. That is, it is more quickly and pleasantly worked by the skilled dentist. Doubtless rubber presents fewer obstacles to the bungler. Cellu-

loid requires a higher mechanical ability, but is more easily manipulated by the expert.

In adaptability, there is little to choose. Both, as now worked, most readily adapt themselves to the conformation of the mouth, and retain the permanent shape given them, the one about as the other.

The cost of each, taking into the account patent royalties, is about the same.

In durability, there has not been as yet sufficient time to fully test their rival merits. An experience of two years warrants the impression that with perfect material celluloid will not be inferior. But too many of the blanks sent out, have been of such inferior quality as to furnish no fair test. Unless greater uniformity in the results of the manufacturers be attained, the palm of superiority must be given rubber.

In appearance, celluloid has immense advantages. Its color is immeasurably better than that of rubber, and when perfect blanks have been procurable, it has not been found that it changes materially with use. It is quite possible with this base to use plain teeth, carving the gum into a close imitation of nature, restoring lost contour, and breaking up the detestable monotony and mechanical appearance presented by gum sections. In this quality it is inferior to continuous gum work, but occupies a station about midway between that and rubber.

In congeniality, whether to the mucous membrane of the patient, or the feelings of the dentist, there is almost no comparison. This is an important point. The immediate and continuous contact of any unsympathetic foreign substance with the delicate mucous membrane of the mouth, may be, and doubtless often is, the cause of serious disturbances. From its very nature, rubber is unsuited for close adaptation to delicate tissues. We all know how uncomfortable is a rubber shoe, or glove, or other close-fitting garment, and this, too, aside from the imperviousness which prevents evaporation from the skin. It is irritating and inflammatory. Vulcanization doubtless reduces this baleful characteristic, but does not destroy its incompatibility. From these objections celluloid seems to be free. Red rubber also contains a large amount of vermilion, used as coloring matter. While this, perhaps, may not mean free mercury in the texture of the vulcanized product, it cannot be denied that it increases the tendency of the plate to irritate, and makes it less congenial to the tissues of the mouth. Celluloid contains but a minute proportion of this pigment, and has therein undoubted superiority.

The objections urged against this base are, its alleged change of color, its occasional absorption of the fluids of the mouth, and its warping when not in actual wear. The complaints of failures in manipulation are, by the awkward, urged against every other base, and may doubtless fairly be at-

tributed to lack of skill. But the charge of lack of stability in the material is a graver one, and if fairly proven is fatal. Celluloid resists the action of most acids, occupying about the same place in this particular as rubber. When properly prepared, it is not more porous, and experience has shown that perfect plates of celluloid are, in impenetrability and fixedness of color, but little more faulty than is rubber. If there be any advantage, it is undoubtedly upon the side of the latter. It is believed that under favorable circumstances, celluloid will be found free, or nearly so, from these objections. The charge of warping, or springing, has been proven to be unsustained. A plate has for months been constantly subjected to the most violent changes of temperature, without, at the end of that time, having been found to be changed at all, though during the whole time it had not once been put in the mouth, or placed on its proper cast.

It is a great pity that the celluloid company has not exercised greater care in the sending out of blanks. Many that are imperfect, of bad color, and only partially cured, have been thrown upon the market. These have mainly fallen into the hands of dentists inexperienced in the use of the material, and therefore incompetent to select good blanks. Dentists, too, living at a distance from the dental depots and ordering from them, are apt to get poor plates, and thus the base itself is brought into disrepute. The demand for celluloid has been, at times, beyond the ability of the company to supply, and this doubtless accounts for their failure to, in all cases, condemn imperfect material. It is hoped that in the future prudence will dictate to the vendors of a commodity which they desire should be brought into common use, that at least its reputation should be firmly established, before the standard be allowed to deteriorate.

But taking into view all its comparative qualities, and leaving out of the consideration the question of its freeing the profession from the detestable rubber monopoly, the conclusion is inevitable, that celluloid has the potentialities which should dethrone rubber, and establish it as the best of the cheap bases for artificial teeth.

REPORT

OF THE

COMMITTEE ON ETIOLOGY.

By D. C. HAWXHURST, Chairman.

I wish to call your attention to a remarkable process of retrograde heredity that is now working changes in the maxillæ and teeth of mankind. In it I believe that we shall find a curious cause of dental infirmity.

It is no new observation that the jaws of civilized races have suffered a notable diminution during their passage from the savage state. Dr. J. H. McQuillen called the attention of the profession to this fact in the Dental Cosmos some years ago.

Changes in the maxillæ of the human race, within the historic period, have been noted by Herbert Spencer, in his Biology (vol 1, p. 455). Examining the collection of skulls in the College of Surgeons of London, he found the jaws of cultivated races invariably smaller than those of savage races. An English under jaw, when compared with that of an Australian or negro, proved to be both lighter and smaller—not alone in absolute weight; it was lighter and smaller when compared with the rest of the skeleton. A modern English jaw was found to be much smaller than the ancient.

I have myself verified these observations by an examination of Morton's collection of skulls in the Academy of Natural Sciences, in Philadelphia. In this collection the Indian, the negro, the Fejee Islander and many other races are represented, and invariably present larger jaws than those of the Anglo-Saxon. In the Steere collection of South American Indian skulls, in the University of Michigan, I have also found the same strong contrast between the jaws of savage and civilized races.

The fact above pointed out having been ascertained, a multitude of interesting questions spontaneously arise, which I have no time to entertain. That which interests us most is the influence which this diminution in the size and weight of the jaws has had upon the teeth. Embryological studies prove that retrograde evolution of the teeth has been pushed to great extremes in some of the animal species. That the teeth of mankind, as well as their jaws, have undergone changes of external size and configuration, there is abundant evidence.

But before noting the precise character and amount of influence exercised by retrograde heredity over the teeth, it will be interesting to pause for a moment to consider a question that is preliminary, and one out of which grow important results. Will the teeth feel the influence of dimished maxillary function as early in the career of a race as the jaws will, and will they fall backward in size as rapidly? Such a question would be impertinent to the subject, if but moderate periods of time were to be taken into account. But in considering a period so extended as that which fills the gap between savageism and the civilized state, it becomes of high importance, since an effect which is so insignificant as to escape observation in a single generation may, with the lapse of ages, roll up a cumulative result that shall compel recognition. The question may be again stated as follows: In a race that is becoming civilized and undergoing retrograde evolution of the jaws and facial bones, will the teeth dwindle as promptly as the jaws and soft parts? Certainly they will not. *The teeth will fall behind* in this process of adaptation to changed function, and *will remain somewhat too large for the maxillæ*. For proof that this *has* been the case, I refer you to a comparison of ancient and modern skulls, and to a comparison of living savages and their cotemporary civilized races. (See also Darwin's Descent of Man, vol. 1, p. 121).

The fact that there has been a disproportionate change of teeth and maxillæ chiefly concerns us here, and not the reason for it; but I will hazard an explanation. It must be remembered that although soft parts and even bones may be reduced in size by lessened function, the teeth are not thus easily modified after they are mature. In the maxillæ as in the soft parts, a first result of diminished exercise is a corresponding decline of activity in the processes of assimilation and tissue building. A lessened density and perfection of tissue results. Following close upon this is diminution in size, as a result of the ever present retrograde metamorphosis. And this in a measure *restores* the *disturbed qualitative integrity*. If vital activities are lessened, the space which they occupy is correspondingly restricted.

But the tissues of the teeth are not as easily moulded to a changed condition of vital currents as bone. Their hard tissues are less pliant to transient conditions. They are therefore transmitted to the succeeding generation, without having been as much influenced by environment as the max-

illæ. This disproportionate rate of change, maintaining itself during the lapse of ages, gives us as the cumulative result or sum of the effect wrought in each generation, a total disturbance of harmony in the size of teeth and maxillæ that is capable of entailing grave consequences.

Up to this point I have done little more than place on record the single fact that the teeth in civilized races are disproportionately large when compared with the maxillæ, and to point out how this state of things has come about. Two important results remain to be noted:

1. What is the effect of this diminished maxillary capacity, combined with an undiminished dental arch, on the dentes sapientiæ. The maxillæ being of insufficient size, the teeth last to take their place, the third molars are erupted with difficulty and do not rise in the jaw, but are obliged to travel forward in order to see the light, as coming from a part of the jaw that ought to have been brought forward by normal growth and evolution of the maxillæ. Thus the wisdom teeth "seem to have no place in the modern jaw." In the savage races there is enough room for them, and in the anthropomorphous apes a surplus. Indeed there is space enough in the maxillæ of the orang to permit the eruption of the third molar at the thirteenth year, soon after the second has appeared, and in serial order with it. This was no doubt the period of eruption for this tooth in mankind at a remote time, but the modern jaw at the age of thirteen is fully occupied, and some years of backward growth and elongation must elapse before the third and last molar can be added to the arch.

And when this tooth at last appears, its eruption is tediously slow; it is attended with inflammation, sometimes great swelling and suppuration. This is especially true of the inferior *dens sapiens*, which, not being brought forward from beneath the base of the coronoid process by maxillary development, often erupts upward into the ramus as taking the direction of least resistance. And when it erupts in its normal position, it escapes from its bed with great difficulty. It is also small, and in a large per centage of cases is absent entirely.

Mr. Weiss, of the Odontological Society of London, has recorded the condition of the wisdom teeth in a considerable number of cases. He made his observations subsequent to the twenty-sixth year, rejecting all doubtful cases. Of all the cases examined by Mr. Weiss, twelve per cent. had never had the third molars. Nearly fifty per cent. had not erupted the full number.

None of the other teeth have been so much affected by the disproportionate development of teeth and jaws, as the third molars. No doubt the reason is that this tooth erupts subsequently to the other teeth, and after they have possessed themselves of the available space.

When it is remembered that the wisdom teeth of the savage are comparatively large, and that those of the anthropomorphous apes are as large as

the other molars, it will be seen that some causative agency has, from an extended period, been acting on this tooth, and that it has made a profound impression upon it.

What then is this agency? Whatever it is, it is something that arises out of the disproportionate reduction in size of the jaws and teeth above mentioned, by which the latter are at this time relatively too large. What then has this agency accomplished in the wisdom tooth? It has dwarfed its crown and reduced the number of its roots. It has rendered eruption difficult, painful and often impossible. It has effected a postponement of its period of eruption to the extent of five years or more, and in a constantly increasing per centage of cases it has altogether suppressed it.

These facts indicate that this tooth is being slowly reduced by retrograde evolution to the condition of a rudiment. That its present cramped struggle for existence may end in its entire suppression at some remote period of the future, is not improbable. That it has been affected very differently from the other teeth by the diminution of the maxillæ, is no doubt due to its position and relative time of eruption. Lying in an osseous cell, whose walls are thick and unyielding, and not coming forward by maxillary evolution, it has had to erupt into whatever space was left for it, after the demands of the other teeth for space were satisfied.

In speaking of a disproportionate development between the jaws and the teeth, I have referred to reactions between the organs of mastication and their environment, which have no doubt been in progress during many thousands of years. I have not meant to refer to that disparity which Dr. Chase has set forth as a consequence of the marriage of German males with Anglo-American females. In that particular instance, as Dr. Chase has pointed out, we have a transient cause of disproportion between maxillæ and teeth, which is a curious result of cross-breeding. (See Dental Cosmos for June, 1876, p. 308.) The disparity to which I allude is the result of a tardier adaptation of teeth to lessened function than of maxillæ to lessened function. Having considered the effect of this state of things on the wisdom teeth, let us look to its effect on the rest of the organs. Dr. Chase has already pointed out the damaging effects of abnormal contact and excess of pressure, causing mechanical injury to the enamel of young teeth and interfering with spontaneous cleansing of the organs, whether young or mature. (See Dental Cosmos for June, '76, p. 308.) After indicating their place in the series of effects I leave these topics untouched.

The second result to which I wish particularly to direct attention, is frailty of structure and weakened vitality of the dental tissues. If the tooth could, like the jaw, shrink to correspond with the ebb of its vital currents, it might retain the primitive integrity of its tissues. But though it can not respond at once in size, it can to some degree in structure. And

it responds in structure a long way in advance of any changes in external size. This is the order of retrograde change in a muscle or other soft part that diminishes from lessened function. First internal or molecular changes, then a falling together of the easily yielding parts. Thus the external size and configuration are modified. But this can not take place in the tooth, the hard part can not contract down on wasting soft parts. Nevertheless, the pulp and fibrillæ of the tooth will change and they will affect an interstitial modification of the hard tissues that they lie in contact with. Thus the structure is impaired; the quality of the tissue is reduced. Dentine and enamel come thus to have a lowered vital endowment, and histological function is out of correlation with histological structure.

Without speculating on the future, it is enough to say that the tardier response of the teeth to lessened functions, as compared with the ready adjustment of structure to function in the jaws, has, I believe, had something to do with the establishment of that carious tendency in the teeth of civilized races, which is so universal.

Much remains unsaid. I have been able to set forth but the barest hint of my meaning. There is some confirmatory matter which there is no time to present to you on this occasion. Nor must it be supposed that I advance these views as any thing more than a small contribution to the etiology of a great subject.

REPORT

ON

ETIOLOGY.

By MARSHALL H. WEBB, a member of the Committee.

Throughout nature all parts of an organism are in a physiological condition—in a state of "ease"—when the function of an organ is not interfered with, or when nutrition is not perfected; but if nutriment be not rich and abundant and functioning be not normal, a *pathological* condition is brought about—a "*dis*-eased" condition follows. Etiology is that department of science which treats of the causes of disease.

The atoms may not combine perfectly and the cells may not produce absolutely normal tissues throughout the organs of a system, hence a *predisposing* cause of disease is established, and through the influence or action of an agent which operates as an *exciting* cause, a manifestation of a diseased condition is usually first observed in or about such imperfectly developed tissue.

Imperfect development cannot be better seen than in the dental tissues. If, for instance, a section of enamel be prepared and placed in the field of the microscope, there may be observed a fissure extending from a sulcus almost or quite through the plate of such enamel, as the result of an imperfect combination of the elements of this tissue. A specimen such as this was presented to Dr. J. H. McQuillen by Dr. R. W. Varney. This specimen was beautifully illustrated, and such fissures, together with the inter-globular spaces (which were also shown in the specimen) described by Dr. McQuillen, in a paper entitled, "Microscopical Fissures in the Masticating Surfaces of Molars and Bicuspids," published in the Dental Cosmos, vol. 13,

page 300, 1871. Dr. McQuillen regards the inter-globular spaces as "a predisposing cause of decay."

Into a fissure, such as referred to, microscopic though it may be, particles of food become impacted during mastication, acids are formed, and act as a cause of caries. Such a result may follow at all those points where foreign substances are held in contact with tissue a sufficient time for putrescence to occur.

The discoveries thus far made and observations noted by Dr. S. B. Palmer in relation to the etiology of dental caries, seem to justify the inference that "Acid forms salts with the substance of the tooth, which salts are at once decomposed by agents found in the saliva, and thus the same polarity is maintained and decay continues so long as the conditions which induce it remain the same;" decay of the black variety being arrested, if "the salts formed by decomposition of the mineral portions of the tooth are insoluble, and become polarized in a negative position to the decomposing agent;" or, as in the white and other varieties, decay may be arrested "by preventing access of the corroding agent to the part;" * * * "this end may be attained by filling."

Through the continuous presence of agents which bring about chemical action, especially upon tissue where the combination of the elements (the phosphates) has been imperfect, or where such combination has been interfered with, this disintegration, if not checked or retarded, reaches the pulp, when disease—irritation—of this tissue is caused by influences operating through the cavity of decay thus formed.

When dentinal caries has advanced this far, and the finely-formed, intricately arranged and very sensitive pulp-tissue is, in the manner indicated, so encroached upon as to cause it to be in a diseased condition, all this prompts consideration in relation to the etiology of the various phases of odontalgia.

Irritation of pulps may be brought about, not only by the agents which cause disintegration of the hard tissues—the enamel and dentine—but more especially by the impingement of foreign substances or carious dentine upon the exposed, or nearly exposed tissue.

If irritation of the pulp be caused by the acid condition concomitant with the active carious process, such irritation should subside upon the changing of this condition—upon the cleansing out of the cavity by the injection of tepid salt water, and especially after the removal of the softer portions of carious dentine and the application of an alkali, such as the bicarbonate of soda. Should the exposed, or nearly exposed, tissue be impinged upon by disintegrated dentine, or a foreign substance which has been forced, during mastication, to so impinge, the irritation thus induced should subside after

the removal of such cause. Where thermal changes cause irritation, and the parts have been treated as indicated, a non-conducting substance should be placed over the part affected, so that fluids cannot approach it.

If an irritant be not removed, or if the agents which bring about the disintegrative and destructive process be not counteracted or made inoperative, the irritation becomes so pronounced as to cause the brain to take cognizance of the pain induced.

Where agencies such as stated continue to operate, pathological irritation of pulp-tissue will not only be indicated by occasional manifestations of pain, but upon the exposure of a part of such tissue, another phase of odontalgia will be noticed—more intense pain may follow—because of the influence exerted by the agents concerned in the causation of the devastation thus far produced; these agents also interfering with the due supply or perfect appropriation of nutritive plasma.

Owing to such interference, cognizable disease ensues, and if the cause or causes inducing it be not removed, the parts cleansed and perfect ease established, devitalization of the pulp eventually follows, accompanied by the occurrence and recurrence of odontalgia partially or fully pronounced.

Some derangement of the pericementum is induced through the devitalization of the pulp, but this is simply evanescent, particularly if the devitalized pulp-tissue be at once removed. The parts of the vessels which are ruptured at the apical foramen when the pulp is removed soon collapse; the blood conveying the nutritive supply for the tissue destroyed, transports it to other pulps or parts; the extravasated fluid remaining about the end of the root or roots, as the result of the rupture of the vessels, is gradually absorbed, and a tolerable condition again established.

Devitalized tissue soon disintegrates and becomes putrescent, and the sulphureted or phosphoreted hydrogen gas arising from such putrescent matter has an irritating influence upon adjacent soft tissue. Should pulp-tissue be not removed soon after its devitalization, or before putrescence follows, gas may escape through the apical foramen (especially if the cavity of decay, in any manner, be closed), and irritate the tissue surrounding the end of the root. This irritation may be caused, not only by such gas, but also by particles of disintegrated tissue, or any matter which may be forced through the foramen while such putrescent tissue is being removed in the cleansing of the pulp chamber.

When gas, emanating from putrescing and disintegrating pulp-tissue, escapes through the apical foramen, nutrition of the elements of the tissues about the apex of the root is interfered with; a separation of tissue or cells is caused by this gas, which gas is absorbed by the watery fluids exuding from adjoining capillaries and the inception of alveolar abscess is thus pronounced.

Dr. W. H. Atkinson has well said, in this connection, that "The contents of the abscess may now be absorbed, and the disrupted tissues again unite, with or without an intermediate stratum of coagulum. If all the extravasated fluid has been taken away, this is an example of most complete resolution (union by first intention.) If coaptation of the lesion has a very thin stratum of coagulable lymph still left between the parts, we have the next best example of resolution, still 'union by first intention.' But if the contents are too much soured by the absorption of the gas to confer upon them the degree of similarity (dissimilarity ?) of tension of molecular currents to favor the dyalissis (dialysis ?) [passage through the wall of the abscess and wall of adjacent capillaries], the process is repeated at the junction of abscess and tissue exactly as before stated, and we have, first, dissociation of atoms; second, formation of gas, etc. And now another opportunity for absorption (resolution) is presented, and the abscess may disappear; leaving an insoluable mass of collapsed epithelial scales, caseous corpuscles, or other insoluble constituents of pabulum that may become encysted and tolerated indefinitely. Or the changes enumerated may be so rapid as to infiltrate all the intercellular territory of the locality with coagulable lymph, so as to literally choke off all neural and vascular circulation to the involved territory, when stony hardness of the part ensues and lays the foundation of phlegmon, acute or chronic, or tumor, benign or malignant, according to constitutional and other conditions."

If conditions be such that resolution can not take place—if there be an accumulation of disorganized or pus-corpuscles—distention of the parts takes place and, because of such presence, induces severe pain and absorption (solution) of the alveolar process; all which continues until the contents of the sac are discharged, either through such alveolar process or the apical foramen.

So long as putrescent tissue is allowed to remain in the pulp chamber, and the mephitic gas arising therefrom escapes through the apical foramen, so long may abscess periodically take place—so long as the cause is not removed, so long may such result follow. A continuance of such pathological phenomenon may result in an almost constant pus-generating surface along the inner part of the sac, which, also, doubtless becomes far more firm in texture than when the abscess first developed within it. It is quite difficult to get rid of this suppurating surface, and to eradicate or make the sac assume such a condition as to favor the establishment of a physiological state in the adjacent parts; but if this is not brought about, a manifestation of disease known as chronic abscess is the result.

While irritation and even inflammation of a part or the whole of the pericementum is concomitant with the diseased conditions thus far referred to, yet its vitality is not notably lessened until the establishment of chronic or erratic alveolar abscess. This condition interferes with the supply

of the elements upon which the membrane, and the cementum which it envelopes, depends for nourishment, and in consequence of this, and the irritation kept up through the chronic abscess, the vitality of the peri-cementum and cementum is finally destroyed, and then, and not until then, all the tissues of the organ—the tooth—are in a necrosed or non-vital condition.

The vitality of the membrane (periosteum) lining the socket of the tooth, may also be destroyed, and necrosis of the surrounding or adjacent alveolar process, and even of a portion, at least, of the maxillary bone, may ensue; the antrum may be invaded so as to bring about a diseased condition within it, and still further complications may arise because of a continued action and advanced stage of chronic alveolar abscess, unless a line of demarkation be made by nature, and the cause or causes inducing all the abnormal conditions be removed.

REPORT

ON

DENTAL ETIOLOGY.

By H. L. SAGE, of the committee.

Etiology is the science which treats of the causes of morbid phenomena in general, and pathology the science of diseased conditions—that which treats of the nature of disease.

Etiology in its relation to the dental tissues, is usually restricted to a consideration of those agencies and morbid conditions which are excitants and predisponents of the affection denominated dental caries, though evidently it may have a wider signification. Inflammatory action in pulp, or periosteal tissue, or the organic constituents of the dentine and cementum, are pathological conditions which may exist without the manifestation of dental caries as an exciting cause, though the former may be a predisponent of the latter by the impairment of vitality or the lessening of vital resistance in the dental organs, thus rendering them more susceptible to the action of external chemical agents.

On the other hand, caries may be an excitant of inflammation or of other morbid phenomena in the dental and contiguous tissues.

Abrasion, whether spontaneous or mechanical, though not strictly a disease of itself, may be an exciting cause of disease, and this may also be said of undue acidity or alkalinity of the secretions of the mouth—of salivary deposits of calculi and of other influences acting externally. A depraved or anæmic condition of the system, nervous disturbance, etc., may be predisposing causes of dental disease. In fact, systemic conditions are greatly influential in the maintenance or impairment of a normal condition of the teeth, gums and alveolar processes.

But the causes of disease in the dental organs being divided into predisposing and exciting, or, in other terms, vital and chemical, more particular reference is had in the former case, to imperfect structural development of the teeth at periods prior to their eruption, and in the latter, to the influence subsequent thereto of external chemical agents which, acting upon the enamel and dentine causes their disintegration or decalcification—to which may be added the more recent theory of parasitic influences; but whether a cause or an effect of caries, has not been fully determined by scientific investigation, though the weight of opinion seems to be that these organisms are merely an accompaniment, whose growth is favored by the presence of acid secretions, a want of cleanliness, or diseased conditions in general of the oral cavity.

But, if the predisposing causes of caries are considered with regard to imperfect structural development, and to a deficiency of the organic or inorganic constituents—then these again may be dependent upon the untoward effects of infantile disease, or other causes, prior to or after eruption which, interfering with proper nutrition, would render the teeth more liable to disease.

In the higher stages of civilization, the diseases of infancy and childhood are of more frequent manifestation than in semi-civilized or savage society; consequently normal nutrition is interfered with to a much greater extent in the former than in the latter case.

A deficiency in the blood of the mother, during gestation and lactation, of the elements necessary for building up these structures, might also, by preventing perfect development, predispose to caries in the teeth of the child.

Again, great deterioration in the dental structures of the mother, may and frequently does occur during these periods, as it is well known that the system may be and often is robbed of the nutritive elements—of the bone-forming materials which tend to the development of the embryotic system, to such an extent as to result in this retrograde metamorphosis, and the consequent loss of the teeth.

Nutrition being thus diverted, in a great measure, from the usual channels, the supply of osseous matter is not equal to the demand made by this extra drain upon the system, for the support of this complex being.

But the action of caries may also be modified as to severity, extent or degree, by the natural changes which the dental tissues undergo, either in the way of deterioration or otherwise, at times subsequent to eruption, for, as age advances, the teeth may improve in their composition, and thus their liability to caries be lessened; *au contraire*, by structural deterioration from any cause, their relative tendency to this affection may be increased.

May not a too rapid growth of the body cause a deficiency of ossific

matter in the teeth by a disturbance of the proper balance of organic and inorganic materials, and thus render them more susceptible to the action of external agents?

If, before full size is attained, the blood is deficient in quality or quantity—in certain constituents, in bone-forming material, for instance—the teeth will share in the general deficiency.

"The existence of certain materials in the blood," says Paget, "induces the formation of corresponding tissues;" and "the blood is definitely altered by the abstraction of every material necessary for the nutrition of a part."

At this period of excessive functional activity, the territory to be supplied may be increased in extent so rapidly that the blood shall fail to appropriate the nutritive material in sufficient quantity to supply the various tissues as fast as may be required for perfect development, thus inducing a lax state of the system and imperfect calcification of the hard tissues; for it is doubtless true that slow growth, if within the boundaries of healthy functional activity, favors the production of perfectly organized dental structures and induces normal development in other directions.

But when the maximum height is attained, in those cases where nutrition has failed to keep pace with excessive rapidity of growth, the tendency to dental caries will be lessened; for, though before this period, the osseous deposits were in limited supply, or were not assimilated fast enough to keep pace with development, the teeth will now become harder and denser, and the osseous system generally will attain to the solidity belonging to adult life; but in most cases the greater part of the injury has been done as the result of caries. These partially calcified teeth, which before were lacking in that density of structure which is so necessary to prevent the exciting causes from being manifested in their decalcification, will, by this limit to the increase of territory to be supplied, become less liable to the inroads of disease.

Any dentist of twenty years practical experience, must have noted during that time, the fearful deterioration in children's teeth, or, in the aggregate at least, a change greatly for the worse; so that now it is rare to find an individual, under ten years of age, with sound dental organs.

It is of almost daily occurrence to meet with children with nearly all of the deciduous teeth disintegrated by caries—mere wrecks—and that long before the time for shedding—with manifold abnormalities of the permanent set, as manifested in defective structural development and irregularity of position, accompanied by varying types of maxillary deformity.

Kingsley and others have attributed these effects to a want of harmony in the development of the physical and nervous system, or in other words,

to an unevenly balanced physical and nervous organization; to an undue state of activity of the brain and nervous system—the mental predominating over the physical—superinduced by the over-stimulation, or too rapid forcing of the intellect before the physical system has attained sufficient development to endure the strain or keep pace with the demands made upon it.

Imperfect development, or deterioration of tooth structure, may also be the result of a defective physical organization, whether the latter be transmitted or otherwise, or of constitutional disturbance from any cause, resulting in the impairment of vitality.

That hereditary transmission has much to do with the defective teeth of the present generation, is doubtless true, when we consider the habits of life which are accompaniments of the higher stages of civilization, and which have, with each succeeding generation, been growing more artificial; while the demands made by society have become so numerous, so imperative, and so tyrannical, as to induce an increase of nervous disturbance and loss of vital force, the consequence of mental anxiety and over-exertion, and of this strain upon the physical and nervous system.

Thus the penalty of this violation of nature's laws has become one of transmission, and is now felt by the generation which has just entered upon the stage of action. "The fathers have eaten sour grapes, and the children's teeth are set on edge"—(Jer. 31, 29; Ez. 18, 2,)—may have been intended to inculcate the principle, that the sins, indiscretions and follies of the parent, must inevitably be visited upon the children; and this truth is growing daily in force by the living illustrations which we meet on every hand.

Nervous disorders are becoming alarmingly frequent. Thus it would seem that nervous disturbance does indeed act an important part in the causation of dental disease, and that vital action has much to do with the maintenance of the integrity, or the improvement or deterioration of tooth structure.

There are other predisposing causes of dental disease to which reference may be made. For instance, there may be an excessive calcification or solidification of dental tissue, in which an excess of mineral deposits will work pernicious results. Teeth of this character, with the dentinal tubules closed, or nearly closed, by this deposition of calciferous matter, will subsequently fail to receive proper nourishment, owing to a lack of circulation in, or reception, or imbibition by the dentinal fibrils of the nutritive fluids, or, as some would say, permeation of the substance of the tooth, by these fluids. In these cases there is a deficiency of organic matter.

All teeth, in order to be healthy, firm and permanent, must not only assimilate a proper amount of nourishment from within through the pulp

tissue, and from without through the peridental membrane and peripheral portions of the cementum and dentine, but also from the alveolar periosteum, and contiguous soft tissues. If this circulation of nutritive fluids is cut off by this closure of the dentinal canals by limy deposits, the teeth become foreign bodies; for, where the conditions are favorable, even though the pulp has been devitalized, a sort of semi-vitality is maintained in the cementum through the root-membrane.

The class of teeth referred to in this connection, presents a white, chalky appearance, and are likely to be associated with puffy, inflamed gums, and crescent-shaped deposits of very hard tartar just under the margins of the latter, which destroys their connection with the teeth, and shuts off what nutritive material should be appropriated through this channel, or, in other words, the vascular supply of bone-pabulum.

These abnormally hard teeth, with their cervical deposits of dark-colored, hard, calcareous matter, would seem to indicate an excess of mineral elements in the blood and saliva. This character of tooth structure, upon which is dependent the loss of circulation and of vital connection, may also be followed by the absorption of the alveolar borders, and consequent loosening of the teeth.

Sometimes, in such cases, if local applications are made use of, as the elixir of vitriol and other caustic agents, and such are not carefully and sparingly employed, they will cause rapid and extensive destruction and recession of the gums, and alveolar processes overlying the roots.

There is another phenomenon to which attention may be briefly directed. Spontaneous or chemical abrasion of the teeth is ordinarily supposed to be the effect of acid secretions. In some cases there appears to be a complication of spontaneous and mechanical abrasion.

In one instance, which may serve as an illustration, the superior front teeth were worn away by occlusion to the extent of one-quarter or one-third the length of their crowns, while the right inferior molars presented very sensitive concave or saucer-shaped pits or depressions on the grinding surfaces, but otherwise, the antagonism of the anterior and posterior teeth was very close and perfect, presenting with the former, a well marked case of mechanical, and the latter, so far as the concave spots were concerned, spontaneous abrasion. This suggests the inquiry, which would seem to anticipate an affirmative reply—is it not possible for mechanical abrasion to take place without the contact of the opposing teeth with the abraded portions,—as in the case of the concavities above mentioned, giving it the appearance of having been produced by chemical agents, when, in reality, the effect was merely mechanical? Doubtless the two may exist together, but these concave spots may have been produced by the contact in mastication of food, seeds and other foreign substances with the dentine, after

the enamel had been worn away sufficiently to expose it—as these saucer-shaped pits were located where the enamel would most naturally have been first removed ; that is, in the region subjacent to the cusps.

If so, what would generally be considered a case of chemical or spontaneous abrasion, with reference to the back teeth, might be merely mechanical—the result of attrition.

Though the worn-down cutting edges of the incisors were sensitive, the concave spots were exquisitely so, until the sensitiveness was entirely and permanently removed by the application thereto, for a period not exceeding two minutes, of carvacrol in full strength.

The left inferior molars, having lost their antagonists, were not abraded, as might have been the case had the concavities been produced by chemical action.

The concave spots sometimes, though rarely observed on the cervico-buccal surfaces of the superior bicuspids and molars, and which present without discoloration of the dentine a very smooth surface, as if cut with a half-round file, would appear to be produced by chemical action, and may be found in the highest type and quality of teeth, and associated with healthy gums and cleanly mouths, and in cases in which caries has been but sparingly active.

But two well marked cases of abrasion of this peculiar character have come under my observation. What the exciting cause is, let others who may have more frequently met with such, determine.

Query : Was this removal of enamel and dentine, in the latter cases, the work of "resorptive cells," to which allusion has been made by Chase in the Mo. Dental Journal, Feb. 1875 ? And may not much of the so-called spontaneous abrasion be due to the same cause ?

What are the local and constitutional effects of certain medicinal preparations on the structure of the teeth, may form a subject worthy of special investigation, and is one to which attention should be directed, with a view to a more thorough understanding of what has assumed a greater degree of importance than has yet been recognized by dentists and physicians.

It is well known that medicines containing acids do have a deleterious effect upon the teeth by their local action upon the enamel and cementum. Their exhibition has become so frequent, and that, too, unaccompanied, in many or most instances, by a use of the means necessary to neutralize their action locally, that many teeth are greatly injured, if not ruined, by their administration. On this fact, so indisputable, as regards the action of acid preparations, it is unnecessary to dwell.

But that the excessive, long-continued, and in some instances, brief use of some alkaline preparations, noticeably the bromide of potassium, has a

deleterious effect on tooth structure, is very probable, whether combined with acid oral secretions or not, though not enough is yet known to warrant any positive assertions as to the effects of alkaline medication upon the teeth, either locally or constitutionally, inasmuch as when these or others are required, the systemic conditions are such as to unfavorably influence the nutrition of these organs.

The effects of disease in the impairment of vitality and the functions of nutrition are so inseparable from the use of medicines, that it is not always easy to determine, in such cases, whether the breaking down of tooth substance is due to chemical or vital action, though it may be simultaneously dependent on both.

Are not alkalies, in some instances at least, destructive to the dental tissues by their chemical action, whether by their employment medicinally or otherwise, they are brought in contact therewith?

That the long-continued use, at intervals, of the chlorate of potash may prove destructive to the teeth, a case in point would seem to indicate. But before citing any examples, it may be well to remark, that isolated cases do not prove theories to be facts, though they may serve as sources from which gleams of light may be reflected. Dogmatic assertions should be avoided, unless sustained by positive proof. But certain pathological conditions may be held up to view, for the purpose of suggesting inquiry and eliciting truth as to the real or imaginary character of the causes which are seemingly associated therewith. Practically speaking, "straws show which way the wind blows."

A young patient, of good physical organization, active, strong and well nourished, had had prescribed by her physician a preparation of the chlorate of potash, for the relief of an affection of the throat, with which she was much troubled during the winter and spring months, up to her eighth year. The potash was always used whenever the trouble appeared. Her teeth were never stained by the greenish deposit so often found upon children's teeth, but were beautifully white, hard, and very dense in structure, presenting, for the deciduous set, a more than ordinarily well-developed denture. The lower molars, in which were most of the cavities, and which would have been the most likely to have been washed by the potash, soon commenced to decay in the proximal and grinding surfaces, though the incisors and canines withstood to the last all chemical action. Fillings were inserted as became necessary, until the number was increased to eleven—three upper and eight lower—so that none of the teeth have been lost by caries, owing to this and the good quality of the tooth substance. In the first right inferior deciduous molar, which erupted in the fourteenth month, the first filling was introduced four months thereafter.

If the observations of Magitot, showing the relative frequency of caries in the different kinds of permanent teeth, it being in the proportion of three in the upper to two in the lower, hold good in regard to the milk teeth, it would show that the rule was reversed in this case, which adds strength to the theory, that the cavities were caused in this instance by the potash. Also, taking into consideration the well-developed and well-nourished physical organization of the child, the character of the teeth, the healthy condition of the gums and oral fluids, the case seems to present an example of the effects of an alkaline preparation in causing caries of the teeth.

Headland says, in regard to the chlorate of potash, (Action of Medicines, p. 317,) "At whatever part of the system it is introduced, it quickly makes its appearance in the secretions of the salivary and buccal glands, the quantity of which it slightly increases. It is to this fact," he says, "of its continued presence in the mouth, that we must refer, I think, the special action of this salt."

If this is true, the saliva would have been impregnated with the potash, and thus it would not only have been brought in contact with the teeth at the time of its administration, but subsequently thereto as well, by its reappearance in the fluids of the mouth.

The temporary teeth are less compact in structure than the permanent, the enamel layers are thinner, and according to some authorities, contain nearly 37 per cent. of organic matter. Of course the enamel plate is more easily broken down or perforated.

To the fact that alkalies act upon the teeth, by dissolving the cartilaginous and fatty constituents, is due the absence of sensitiveness, which is characteristic of caries produced directly by excessive alkalinity, as the sensitiveness resides in the vital portion.

In the case above referred to, there was very little sensitiveness attendant on the preparation of the cavities for filling; and in the case of a young man, in which the teeth were affected with caries of a very extensive and destructive character, and the fluids of the mouth were excessively alkaline, the cavities, though large, and situated, many of them, on the labial and lingual surfaces, as well as in every conceivable location, were unusually free from sensitiveness. As this case has been described by the writer, as to the character of the decay, the treatment, etc., only a few points will be presented in regard thereto, as tending, perhaps, to throw some light on the etiology of dental caries, in this and similar conditions.

Before the fillings were introduced in the front teeth, the gums which overlapped the ragged cemental borders of the cavities on the labial surfaces, were very much thickened and inflamed; and when litmus paper previously reddened by an acid, was held near and over them, vapor was evolved in abundance, and could be distinctly seen, and the paper immedi-

ately presented an alkaline reaction, indicating the presence of a volatile alkali, probably ammonia, thrown off by the decomposing organic tissues, the then diseased gums of the individual, which are now perfectly healthy, the sources of irritation (ragged borders) having been removed and other treatment instituted.

Now, if decomposing animal and vegetable matters, as inflamed, puffy and purulent gums, particles of animal and vegetable diet, etc., evolve ammonia when in the mouth, as fermenting and putrescent organic animal or vegetable matters do in other localities, why may not this agent (ammonia) when in excess, by acting upon the animal portions of the dentine, especially in teeth which contain an undue portion of organic tissue, produce caries therein of a more or less destructive type?

The evidence of the presence of such an agent in this case, and the alkalinity in excess, of the oral secretions, appears to have been substantiated by proper tests; and as before stated, the almost entire absence of sensitiveness in the cavities would give force to the view; as one of the most efficient means of obtunding the sensitiveness of dentine is to keep the cavities free from acids for a time by temporary fillings.

In regard to the destruction of the teeth by alkalies, Prof. Summers, at a meeting of the American Dental Association, is reported to have said that acids act by combination, and alkalies by disintegration; meaning, probably, that in the former case, by the combination of acids with the inorganic portions of the teeth, decalcification is produced, and in the latter, by the dissolution of the organic matter in the dentinal tubes and ultimate loss of vitality, the breaking up or disintegration of the mineral substance of the tooth is effected; for it is well known that a tooth bereft of vitality becomes brittle, and disintegration sooner or later ensues. May not this be an explanation of the local action of alkalies upon the teeth, whether by excess in the fluids of the mouth, or by other means they are brought in contact therewith? Or the action may be indirect, if by combination with oral secretions other destructive agents are formed.

The following may serve to illustrate the effects of alkaline medication upon the teeth, in connection with an anæmic condition of the system, perhaps dependent on nervous trouble, which might, of course, predispose the teeth to decay, by rendering the vital force resident therein less capable of resisting the action of external agents.

A lady was ill, and under medical treatment for a period of nine years; and though now considerably improved in health has not entirely recovered. This lady commenced to take homeopathic doses of the bromide of potassium seven years ago, when her teeth began to deteriorate. Six years

ago the administration of larger doses of the same was instituted three times daily, under allopathic treatment, which treatment was continued until about one and one-half years ago, when the bromide of sodium was substituted for the potassium.

Meanwhile the teeth continued to deteriorate, until they became mere wrecks. In the early part of her illness she also took muriate of ammonia. She could not take iron and has not taken any acid preparations. Her teeth show plainly the effects of this seven years' course of alkaline medication, though as before stated, nutrition must have been seriously interfered with by the malady; but as this would account only in part for the very extensive and almost total destruction of the teeth, it is evident that the bromides were the main cause of the loss of the dental organs.

As to the characteristic appearance of the remaining inferior teeth, (for the remnants of the upper denture had recently been extracted by a physician), all were much broken down in structure, excepting the incisors, the natural color of which, with the others, was indistinguishable, owing to a dark brown deposit with which they were thickly coated. The crowns of the lower molars were absent, some of the roots remaining. The inferior bicuspids presented sharp, ragged points or spurs of enamel and dentine on the grinding surfaces, with irregular patches of blackened and softened tissue about the cervical, facial and proximal surfaces, portions of the buccal and lingual walls only, in some instances, being left standing, with other and similar features, as to the appearance of the cavities.

Does the bromide of potassium act directly, by seizing upon the organic portions of the teeth, or indirectly, by forming, when brought in contact with acid oral secretions, hydrobromic acid, which, seizing upon the inorganic substance of the teeth, rapidly corrodes the enamel? May not the method, degree and directness or indirectness of action, as well as the character of the decomposed tissue, depend upon the acidity or alkalinity of the oral secretions with which the medicine combines, and the agent, if any, which is produced by such combination?

From the fact that the cavities in this instance presented this irregularly outlined appearance, the diseased dentine being soft and leathery, it would indicate the indirect action of the bromide of potassium by the production of an acid.

On the other hand, the fact that the decomposed dentine was nearly or quite black, would indicate the action of an alkali. Dr. Black, in a paper published by the Ill. State Dental Association, states that he has generally found black decay associated with alkaline saliva. Here the calcareous matter seemed to have been disintegrated, leaving behind organic tissue, though the patient would not permit more than a mere superficial examination, from which the character of the residue could be determined.

In another case, the administration of the bromide of potassium for a period of nine months, rendered the inferior teeth, especially, very chalky, whereas, just previous to the exhibition of the medicine they were well organized and highly polished structures, which might indicate the dissolution of the organic substance.

A personal use of the same medicine for a very short period, rendered the necks of the inferior teeth very sensitive; at least they were not so previously, and they are still exquisitely so. The sensitiveness would indicate the presence of an acid, produced by the combination of the medicine with the fluids of the mouth.

Besides ammonia, sulphureted hydrogen gas is frequently thrown off in the mouth, as a product of the decomposition of organic matter.

This gas yields, with metallic bases, besides water, sulphurets, many of which are insoluble and highly colored.

Dr. Black, whose experiments are cited by Dr. H. A. Smith, attributes the different colors observed in caries to the precipitation by the sulphureted hydrogen of certain metallic substances in the form of sulphurets, the color being influenced by the acidity or alkalinity of the oral fluids.

Thus iron, which is one of the constituents of the blood, would find its way into the dental tissues, and on the occurrence of decay might, by its precipitation by the sulphureted hydrogen, influence the color of the decayed portions.

To prove this, Dr. Black subjected teeth to the action of an acid solution, through which a stream of sulphreted hydrogen gas was passed, which gave a yellowish color to the solution, which was also imparted to the teeth. By neutralizing the acid solution with soda while the gas was passing through it, until it gave a decided alkaline reaction, the black color was observed, and by varying the intensity of the acidity or alkalinity, the various colors seen in caries were produced.

Reasoning from the results herein stated, the cause of the caries as well as the color, in the before-cited case of medication with the bromide of potassium, might be explained on this hypothesis: Assuming that the bromide of potassium was present as an alkali, as shown by the black color of the caries produced, the color being dependent on the action of the three agents, sulphureted hydrogen, bromide of potassium and iron, we may infer that an alkali was the exciting cause of the caries, for, according to the above theory, had an acid been present to have acted on the teeth, the caries would have been of the white or yellowish color.

It will be said that the bromide of potassium is a neutral salt, and so it should be; but on testing several specimens produced by prominent and

celebrated manufacturers, or at least taken from bottles labeled as theirs, the reverse was found to be true.

Slips of tumeric and litmus paper, the latter having been reddened by an acid, presented a decided alkaline reaction, in every case, on being applied to aqueous solutions of the bromide of potassium from a sample of each.

Therefore the exhibition of the bromide of potassium of commerce must be considered as alkaline medication.

The iodide of potassium, the bromide of ammonia, and similar preparations all act, probably, deleteriously on tooth structure, and in a manner similar to the bromide of potassium.

The iodide of potassium often contains the latter, and a tested specimen from a reliable house gave a strong alkaline reaction.

Concerning the various metallic substances which exist in the blood, and find their way into the system, which are present in the saliva and in the foreign matters in the oral cavity, which are inserted as fillings, etc., and which might influence the color of caries, it is unnecessary to enlarge. This seeming diversion from the subject was entered upon, as perhaps tending to show that the color of caries may sometimes indicate the cause, when the history of the case is known.

How the bromide of potassium and similar preparations act in the destruction of the dental tissues, is a question which invites investigation by the chemists of this and kindred organizations, and upon which the writer hazards an opinion only; and as it would more properly come within the scope of a report by the committee on dental chemistry, he here rests this portion of the subject, so far as the direct action of alkalies is concerned, in the causation of caries of the teeth.

Carbonic acid is also a product of the decomposition of organic matter.

Diseased gums and the debris of animal and vegetable matters, which latter finds lodgment in the mouth, and is allowed by uncleanly persons to continue in contact with the the teeth for indefinite periods, are continually evolving carbonic acid. It is also present in the month as a product of respiration and by evolution from the stomach, but whether it might be eliminated in sufficient quantity to prove destructive to the teeth, is a question.

The experiments of Magitot, Berzelius and Dumas, as cited by Wedl, of decalcifying teeth by subjecting them to the action of carbonic acid, as contained in Seltzer water, (one volume of water to five volumes of gas,) when the enamel became friable and the dentine softened, would suggest that this acid might be thrown off in sufficient quantity to prove destructive to the teeth.

The carbonate of lime, of which the enamel and dentine contain a small per centage, is soluble in carbonic acid, while the phosphate of lime is sparingly soluble. If it originated caries in certain cases, by seizing upon the carbonate of lime and disintegrating it, the other constituents would be rendered more susceptible to the action of chemical agents, by furnishing a larger surface to be acted upon by acids or alkalies, or by affording a foothold for fungi, and thus the progress of caries be accelerated.

If alkalies, in some cases, produce caries by chemical action, may they not also act indirectly, that is by the manifestation of constitutional or systemic effects, by which the teeth are rendered more susceptible to, or less capable of, resisting such action? We are told by Headland, that "alkalies dissolve fats and cause spareness of the system."

What then? Spareness of the system—anæmia—indicates defective nutrition. Defective nutrition causes deterioration of tooth substance, and at an earlier period imperfect structural development, by a withholding of the elements necessary for building up sound and healthy tissues, and by the impairment of vitality generally.

Headland also says—Action of Medicines, p. 188—"Saline medicines dissolve fibrin and waste the blood. Alkalies do the same." "By this dissolution of fibrine," he says, p. 202, "they (alkalies) appear to lessen its deposition and retard its formation," thus hindering nutrition and causing wasting of the tissues; p. 203, "alkalies pass out into the secretions as salts, having first combined with acid in the system, so that they must leave behind a certain excess of alkali in the blood, by which their action is continued for some time." Thus excessive alkalinity, by impoverishing the blood, causes the wasting and mal-nutrition of all the tissues.

Though in health the blood is said to be slightly alkaline, this alkalinity is increased in some diseases, as in fevers of a low type, as malarial, typhus and typhoid, in malignant scarlatina, etc., when the blood is supposed by some to contain an excess, and from this fact treatment by the administration of acids, mineral and vegetable, has been instituted with success, (Headland, pp. 136 and 138,) the effect being to neutralize the excess of alkali in the blood.

The question here arises, does this excessive alkalinity of the blood, which is supposed to be due to ammonia, act upon the dental tissues chemically as well as systemically?

Ammonia being volatile, is excreted on the mucous surfaces of the lungs, on the skin, and from the breath and saliva, and in febrile disorders is present in the blood in undue quantity; the oral cavity might, by this means, contain it in excess, and thus it might prove deleterious to the teeth by attacking the organic portions, in addition to the mal-nutrition of the system, which might more particularly predispose to such action.

Dr. Watt is reported as having said, (Dental Register, May, 1875, p. 214,) "When decomposition results in the presence of ammonia, caries is more likely to result than if the fluids of the month were slightly acid," and he explains this by saying, "Nitric acid results from ammonia, causing white decay."

Dr. B. Jones has also stated, (Headland, p. 389,) that ammonia in large doses undergoes oxidation in the system and produces some nitric acid, which statement Lehmann and Jaffe' call in question, the latter having arrived at a contrary conclusion, by a repetition of Dr. Jones' experiments.

But if the presence of ammonia in the system results in the production of nitric acid, why administer an acid to neutralize excessive alkalinity? If the alkalinity were due to ammonia, and the formation of nitric acid was the result, would the administration of acids be deemed necessary? By such chemical action the alkalinity could not continue to exist, and if the statement of Headland is true, (p. 392) that "the fact, if established, of the increased excretion of ammonia by the breath and skin, in low fevers and eruptive disorders, is by itself a contra-indication to the employment of the agent, because showing that there is already too much of this alkali in the system."

The development of oral organisms in connection with, or as accompaniments of dental caries, has led to a consideration of the question as to what part they play, or whether any, in the destruction of the dental tissues.

While some consider them to be the originators of the disease, the weight of evidence seems to indicate that they are merely outgrowths or consequences of it.

Prof. Pierce says, "It is a question worthy of consideration, whether the presence of these organisms might not rather pass for consequences of the disorder than causes."

Prof. McQuillen considers that the fact that these organisms can be found in great numbers in the months of persons whose teeth are perfectly sound, is fatal to the theory that they exert a destructive influence, though he seems to think that the protococcus dentalis, or green fungus, which is found so frequently on the teeth of children, is an exception.

Wedl, on the contrary, (Dental Pathology, p. 415,) considers that the protococcus dentalis (associated with a form of caries termed by Klenke vegetative decay of the teeth,) is only an accompaniment and not a cause of caries.

The leptothrix buccalis, so frequently a concomitant of dental caries, Leber and Rottenstein regard as a cause of caries, or at least that it is only necessary that a mere surface breach of the dentine, however small, be effected by acids or otherwise to permit of the penetration of and prolifera-

tion in the tubules by the fungus, and that in cases where the destruction of the teeth is at all extensive, a participation by the leptothrix is requisite, and that caries is thus developed much more rapidly than when acids alone are the destructive agents; and they assert that leptothrix cannot penetrate normally hard enamel, and probably not dentine, without such previous surface action by the acid, and that the latter is, in dry caries (so called) the sole active agent.

Wedl is of the opinion that the death of a considerable portion of the dentine by the action of an acid is necessary, to render it possible for the fungus to penetrate and expand the dentinal canals, which phenomenon he has never observed in the deeper layers of hard, carious dentine. Owing, also, to the fact that he has been unable to find any deposit of leptothrix on the exterior or interior of a tooth prior to the formation of a cavity, he considers that leptothrix have no direct connection with the origin of caries, though we are led to infer that after the death of the dentine by the action of acids, the leptothrix buccalis is the active agent of decomposition, or in accelerating the decay by the penetration and expansion of the dentinal canals.

In the lower incisors, where the acid is neutralized by the saliva, "caries," he says, "does not occur, notwithstanding the presence of thick layers of leptothrix, such as are met with in tartar."

But caries, not unfrequently, does occur here, though probably consequent on chemical action. This is the substance of opinion concerning the influence of oral organisms or fungi, in the production of caries.

To recapitulate: The origin of dental caries, so far as chemical action is concerned, is, in the opinion of most dental writers, dependent on the abnormal secretions of the gums and other portions of the mucous membrane of the oral cavity, and also of the salivary glands, as well as by the lodgment about and between the teeth of putrescing and fermenting animal and vegetable matters taken as food, any or all of which, by decomposition result in the production of acids, which extract the calcareous salts from the mineral portions of the teeth, thus decalcifying and disintegrating the affected territory; while few will deny, at the present day, that vital action is also influential in promoting or retarding the disease, many, if not most, hold with Prof. Garretson, that "Caries of the teeth is a chemico-vital action, and most markedly a trouble of hereditary transmission and predisposition." He regards it as "more of a vital or constitutional than a local or chemical trouble," and, as "most scientifically treated as caries of bone is treated," i. e., by local and constitutional treatment. "It is inflammation in the one case and inflammation in the other," modified by the differences of structure which exist between the two. If the bones were as much exposed to the direct action of external chemical agents as are the teeth,

they would be likely to suffer as frequently from the same causes, in a measure proportioned to the relative liability of the two to inflammatory action.

But the various theories advanced by dental writers as to the causes of caries are too well known to require even brief mention at this time.

But few, if any, writers of note seem to recognize that alkalies exert any direct action upon the teeth. That the action is limited, must be admitted, and that they act at all is not, perhaps, established by conclusive proof, though enough has been stated to indicate that they may, in certain cases, and in certain directions, exert a deleterious influence upon these structures, which influence is dependent in extent and degree, as is the action of acids, on the relative proportions of earthy and animal matters in the composition of these organs, which latter condition is also modified by the age, health, diet and hereditary influences affecting the osseous system of the individual, as well as the nourishment received by the embryotic system or tissues during this portion of the formative period.

The action of alkalies upon the system, as a predisposing cause of dental disease, has not, so far as a necessarily limited observation extends, received any attention, in order to determine if any such influence exists, though vitality must be affected in a greater or less degree by the acids and the alkalies with which the system may become charged, if in excess, and thus by its impairment or quickening, influence the character of all the tissues and organs of the body.

It is quite difficult to separate the chemical from the vital theory, and admit one to the exclusion of the other, when considered with regard to the part taken by these forces in the impairment or maintenance of health in the dental tissues; since the nutritive functions, if action is normal, will enable the teeth to withstand to a greater or less extent the effects of chemical agents, though by a cessation or impairment thereof, they are rendered incapable of such resistance from such a source, so far as any influence of this nature can be of service.

DISCUSSIONS.

Dr. Clowes: The wisdom tooth has had rather a bad name among the dental profession, and it has been popularly supposed to be the weakest tooth in the mouth. This is a very mistaken idea. It is, on the contrary, one of the strongest of all the molars. This will be evident to any one who will make an examination of the surface of these teeth. For instance, take the sixth-year molar. It has from three to five weak places in its enamel. The twelve-year molar has from two to three weak places, whereas it is a very rare thing to find more than one weak place in a wisdom tooth. It seems to me that that is pretty good evidence of natural strength.

Dr. Abbott: Just one word in regard to the sixth-year molar. Dr. Clowes has said that that tooth is generally lost early. That is a very erroneous statement. In the hands of a skillful dentist, I see no reason for its early loss. There are a great many sixth-year molars that can be saved a long time, and there are a great many wisdom teeth that are good for nothing, even if saved, because they are nothing but little pegs. In a great many instances these teeth never come, and again, you see many people with only one molar on a side, and frequently there is only one cusp or point antagonizing against the opposite tooth, and that is the only masticating surface you have. The course of a wisdom tooth in coming, is almost always outside the arch in the upper jaw. In the lower jaw it may be in a line, it may be outside, and it may be inside. There is no regularity about it, and if you extract the sixth-year molar, and depend upon the wisdom tooth, the result will be that your twelfth-year molar will be tipped forward, so as almost to destroy the masticating surface. I shall raise my voice most emphatically in favor of making it a general rule to save the sixth-year molar. There are cases where it is necessary to extract it. I have had one within a month, where I found it necessary to remove all four of them, and yet they were all sound and healthy. The trouble in this case was that the teeth were so excessively large as to impair the expression of the face.

Dr. Hunt: I am sorry we have not more time to discuss these im-

portant questions. Etiology is one of the most important branches of science to us, because if we can pursue it so far as to find the cause of decay of the teeth, and diseases of the oral cavity, we have made one great step toward ascertaining the remedies which will prevent that decay.

Our function as dentists is not so much to cure the existing disease, as to prevent a recurrence of that disease. If we wish to accomplish our mission, we must go back of the actual disease, ascertain the cause of the decay, and then apply the remedy calculated to prevent a recurrence of the trouble.

There is a movement on foot in our country, by which it is desired to unite the whole profession in this country and the whole world, in collecting statistics with reference to the condition of the human teeth in connection with food, habits of living, etc.

We know that the teeth of people in this country are deteriorating in every generation. Teeth in this generation are inferior to those of the preceding, in structure, durability and strength. In a paper read in Washington—a paper full of stubborn facts with reference to the crania of the races of this continent, it was stated that out of a collection of a thousand skulls of North American Indians, where every skull was minutely examined, there was found to be only two cases of caries—arches well developed, teeth magnificently structured, and perfect in their appearance. There was but one case of irregularity found in the whole collection.

Dr. McQuillen: In the admirable paper presented yesterday by Prof. Hawxhurst, he directed attention to the retrograde evolution of the jaws, indicating that there has been a contraction on the part of the jaw, commencing with the savage races. It is well, perhaps, for us to remember what is stated by Macauley—that when the legions of Julius Ceasar entered England, he found the inhabitants of Britain on a level with those which Capt. Cook discovered in the Sandwich Islands. Here we have evidence of the fact, however much we may controvert the views of Darwin, of our origin from a lower race of beings—that the highest of civilized people have sprung from savage life. In connection with this point, my friend referred to the skulls in the Academy of Natural Sciences, as bearing out the position which he there presented, as to the difference in the form of the skulls in savage and in civilized life. I have brought with me, in support of his views, a specimen belonging to me, being the skull of a negro of low type, and in presenting this skull I do not wish to be understood as asserting that there is no power of development on the part of the negro. I merely present this as an illustration of the development of the jaw in a low type of the negro, and you will observe the immense jaws, the wide-spread condition of the teeth, etc. Here, again, we have another skull of an Australian, where you have a wide expanse on the part of the jaw, and a

fine development of the teeth. Then, again, we have a Sandwich Islander. Here there is a nearer approximation to the jaw of civilized life, but at the same time you will observe that there is a broad expanse of jaw—no contraction, no irregularity, so far as the teeth are concerned. Here, again, I present to you the skull of an Indian from Florida, which exhibits the same general points. In the collection of skulls at the Academy of Natural Sciences, we have the civilized and the savage races represented—the civilized races of ancient times, of Greece, Rome and Egypt, in their palmiest days. We have also the savage races of ancient times, and the savage races of our own day. And in all this collection I do not recall a single instance of irregularity. Now, what is the reason of this? It obviously is because these races lived according to nature.

The food selected was not of that delicate and luxurious character in which civilized nations are in the habit of indulging. It was coarse food—simple and unseasoned. The food of such races has more resistance, and its mastication consequently has a tendency to develop the jaw. Not only is this true of the savage races, but it is true also of the English, German and Scottish people who emigrate to this country, who have been accustomed to live in a natural manner.

We hear much of the importance of our food containing the phosphates and carbonates of lime, in order to a proper nourishment of the teeth. Are we to forget that the teeth are not made up of phosphates and carbonates of lime? We want meats, as well as phosphates and carbonates of lime.

There is another point I wish to touch upon: In this skull (indicating) you will observe a loss of the teeth in the lower jaw on the left side. There has been absorption as a consequence, and you will observe that the molar stands out from the alveolus. Here we have an illustration of the harmony of antagonism. People are kept in their places by having antagonists, and so are teeth.

Dr. Atkinson: I am generally upon both sides of any question which is presented before this body. For there are a great many sides to every truth.

I wish to speak more particularly just now upon the subject of etiology in its bearings upon the deterioration of the teeth, and endeavor, in some measure, to account for the wide-spread deterioration in teeth of the present day. I announce it as my opinion that it is due to a difference in the mode of nourishment during the infancy of the children of the past few generations.

If you take the lines of country where disease is most prevalent in the organs of mastication, and those where it is least prevalent, you will find this difference: that in the first case this custom prevails—the mothers as a

rule nurse the child until it is able to begin to masticate food and appropriate the elements, and then, instead of allowing the child to chew the food, the mother reduces its food to a pulp in her own mouth and then puts the mass in the mouth of the child. This process has robbed the food of some of its most essential elements.

If we inquire into the primary cause of early decay of the teeth, we will find that it consists in improper nursing and nourishment during the period of infancy.

If the child, after being well begotten, gestated and born, is supplied with the nourishment which nature has provided, the dental organs will get a sound and healthy development.

REPORT OF THE COMMITTEE

ON

DENTAL LITERATURE.

By M. S. DEAN, Chairman.

Having received no response from the other members of this committee, to the inquiry as to what branch of dental literature they would report upon, I am led to believe that whatever is written upon this subject must, unfortunately devolve upon myself.* I shall, therefore, treat the subject under the following heads:

I. Journalistic Literature.

II. Transactions of Societies.

III. Books.

The first branch of this subject was very ably and quite fully discussed in a report by one of the members of that committee at the meeting of this Association in Detroit; and, as much that it contained will apply with equal force to-day, and as it expresses, with some exceptions, which will be noticed hereafter, the views of your present committee, it will be unnecessary now to go over again the whole field embraced under that head.

The Journalistic Literature may be divided into two classes. First—Journals which are published and controlled by manufacturers and dealers in dental goods. Second—Those which are published independently of such establishments, and of dental institutions of any sort.

There are five of the former class published in the English language, all

*Since presenting this report, I have learned that Dr. E. S. Gaylord mailed a paper to me upon this subject, which has not been received.

of which are of American origin, viz: "Johnston's Miscellany," the "Cosmos," the "American Journal of Dental Science," the "Dental Register," and the "Missouri Dental Journal." Of the latter class there are three, viz: The "British Journal," and the "Monthly Review," published in England, and the "Pennsylvania Journal of Dental Science."

It will be seen from the above that of the six dental journals published in America, only one belongs to the latter class. Is this fact of any significance as to the tone or character of our periodical literature? Does it indicate that the standard of these journals has been lowered in the hands of such publishers, or that the cause of education and science has been retarded through the influence of the commercial interests with which these journals are connected?

After a candid and impartial consideration of this question, I conclude, and I think most of the profession will agree with me, that the connection of commerce with journalism has not thus far tended to produce these evil results.

Some of our members, however, whose opinions are worthy of great respect, and I may specially name the author of the admirable report referred to, entertain contrary views, which were decidedly expressed at the above-mentioned meeting.

But what disadvantage arises to the profession from the fact that these journals are published by men who are engaged in commercial pursuits? Their pages are as open to the profession for the discussion of all topics as if they were entirely independent of the houses that furnish the means of publication. This might be otherwise if there were but one or two dental journals published in America; but as we have six competing journals, no literary production of real worth pertaining to dentistry is rejected, even though it tend to disparage the commodities which are advertised within the same covers. No one could reasonably claim freer media of communication in any so-called independent journals than we now have in those which are published by commercial houses. The objection raised against this class of journals, in the above-named report, "that any dealer in dental goods publishing a magazine, is liable to lose a customer if he declines to publish an article sent him, no matter how crude, illy-constructed, or ungrammatical it may be," is certainly inconclusive. It seems to me that this argument would apply with equal, if not greater, force to journals that claim to be independent; since the publishers of these depend entirely upon subscriptions and advertisements, and would naturally be less inclined to risk the losing of this patronage by declining to publish whatever may be sent them.

In observing the management of these journals for several years past, your committee has been unable to find cause of complaint, in regard to this

particular feature of our journals, viz: their connection with commercial interests; but, on the other hand, we believe that at the present day, at least, they are more beneficial than if they were conducted upon the "independent" plan.

Let us suppose, for instance, all our dental journals to be independent of all business interests, etc.; they must be sustained, not alone by the subscribers, but by the "dealers in dental goods," and by the dental colleges; for there is no journal that does not receive a considerable share of its support from these latter sources; and without this aid, even if they survived at all, they could maintain only a feeble and sickly existence. Being thus dependent upon the advertisements of manufacturers and venders, and of dental colleges, by parity of reasoning they could ill afford to admit articles into their columns that would speak unfavorably of the conduct of any dental institution, or of the goods and appliances of any dealers advertising therein, lest these sources of revenue should be withdrawn.

Suppose we concede that journals connected with business interests "are apparently published with the design of causing their literature to carry the advertisements"; is it not clear that the better these publishers make this vehicle, the more extensive will be the circulation of their advertisements, and the more successfully will their object be accomplished? Hence, the shrewd business man, with abundant means at his command, would spare no pains or expense in making his journal such a vehicle.

Besides, it will be admitted that manufacturers and dealers in dental goods, men accustomed to the details of general business, and having commercial relations in various parts of the country, can publish and introduce a dental journal at much less expense than could be done by men of our profession, and hence they can afford us a better and larger journal at the same cost.

Now, what are the real facts concerning the quality of the journalistic literature published by men connected with commercial houses, as compared with that of journals called "independent"? Has there been, or is there now any dental journal, which is disconnected with such houses, that is more ably edited or better adapted to the wants of our profession? Are the selections made with better judgment, or is the original matter any nearer what such periodicals should contain? These questions can be best answered by taking the leading journals that are connected with manufacturing and commercial houses, and comparing them with the best that are published independently of such interests. The only journals that belong to the latter class and published in the English language are the "Pennsylvania Journal," the "Monthly Review," and the "British Journal." The "Pennsylvania Journal" is an American production, and we do not under-

estimate the energy and ability of its editor and publisher, nor detract from the value of this journal, when we say it certainly can not claim superiority over the "Dental Cosmos," nor indeed over any of the other five journals belonging to that class. The other two are published in London. While they are edited with unquestionable ability, yet they contain considerably less reading matter, and are not so well adapted to the wants, at least of the American dentist, as several of our own journals. Though they contain many articles of great scientific merit, to which we bow with profound respect, they at the same time contain others which are pretentious, and as authorities, are at least questionable. In pathology, therapeutics and operative dentistry, we consider our leading journals the more reliable. But in physiology, histology, and kindred sciences, we cheerfully yield the palm to our British brethren.

Both of the London journals contain abstracts of the proceedings of the Odontological Society of Great Britain; the British Journal contains, also, the reports of the Dental Student's Society, and of the Odonto-Chirurgical Society.

One of the commendable features of these journals is, that neither of them copies articles originally appearing in the other; and though they borrow quite freely from the medical literature of Great Britain, and the medical and dental literature of Germany and France, and to some extent of America, the same literary or scientific matter, with the exception above named, is rarely found in both.

On the contrary, in America, we sometimes find several journals containing the same article, even among their "original communications." This is, perhaps, more the fault of the editors than of the authors, since it should be stated specifically in the journals on what conditions the articles will be accepted, so that writers can understand clearly the ethics of contributors. Only such articles as contain new and important scientific or practical facts should be copied from journals that are accessible to the profession. In this respect our journals might imitate the practice of our English neighbors with satisfaction to the reader.

There are evils in all our periodical literature, for which your committee are at a loss to point out a practical remedy. I allude to the errors which are often found in articles of some considerable value, and which may confuse or mislead the young practitioner; communications which are, in some respects, too valuable to be rejected, but which, in some of their teachings, conflict with known scientific principles.

The question is: Should these errors be pointed out by the editor in the same number in which such article appears, or should they be left for the future criticism of some writer who may discover and correct them; or should the article be rejected?

Your committee is of the opinion that either the first or the last plan should be pursued. And yet the first course, though preferable, would be requiring more of the editorial department than is generally the case in medical journals.

While all our dental journals contain from time to time articles of great value, both of a scientific and practical character, we find in them, also, articles abounding in visionary hypotheses, supported merely by surmises which are gravely stated as facts; yet, as a whole, our journals are conducted with increasing vigor and ability, and are, perhaps doing fully their share in advancing the interests of our profession. Happily the practice of dentistry is for the most part founded upon demonstrable science, and is not seriously effected by wild speculations, which indeed may sometimes contain in a crude shape some advanced idea which other minds may sieze upon and make useful to the profession.

Your committee would urge upon the members the importance of liberally supporting our journals; for, without them no practitioner can keep pace with the progress of dental science and art. And to those who have not already done so, we would say: add to the number of your periodicals either the "British Journal" or the "Monthly Review, for these, though they can not supply the place of your own journals, will be found of great value, and may fill a want not supplied by our own.

While many of our members subscribe to all, or nearly all, of our journals, none should take less than three or four of these, besides one at least from abroad. You will find in all these considerable matter which, to most of you, will be worthless, but which to others may be useful or interesting. But fortunate will be the practitioner whose scientific education and logical habits of mind will enable him to detect the errors and fallacies which some of this literature contains; and thrice fortunate he who avails himself of the valuable truths in which they abound, to enrich and perfect his knowledge of the profession of his choice.

II. LITERATURE OF TRANSACTIONS OF SOCIETIES.

Some of the best dental literature of our country may be found in the transactions of our associations: and perhaps I might add with equal truth, some of the worst also.

Seven of the state societies—Illinois, Pennsylvania, California, Iowa, Wisconsin, New York and Ohio—have inaugurated a system of publishing separately their annual proceedings.

The Illinois State Dental Society was the first to adopt this plan, and has already issued eight consecutive annual volumes.

The Pennsylvania Dental Association comes next in order, both as to

time and the number of volumes issued; and the Dental Society of the State of New York has recently published its second volume of transactions, which contains the proceedings of the sessions of 1873 and 1874, the first having contained the transactions of the two preceding years.

A portion of these printed transactions, and of the proceedings of other societies, have found their way into our monthly journals. Indeed, the essays and reports of the discussions of dental societies constitute a considerable share of our journalistic literature.

While some of the essays in the transactions published by these societies are exceedingly faulty, both as literary and scientific productions, and nearly or quite valueless in their practical teachings, the most of them possess some merit, and a few are excellent. But notwithstanding these imperfections, and the still grosser blemishes which often appear in the reports of discussions, these transactions are evidently deemed of sufficient interest and importance to the societies themselves to warrant their publication.

Some of the members, however, would prefer the omission of such matter as is not of sufficient merit to reflect credit upon their society; and doubtless nearly all have felt somewhat humiliated by some of the literature of our transactions, and would be glad to see our societies less ostentatiously display their ignorance upon many subjects.

In the April number of the Dental Cosmos the editor doubtless expresses the sentiment of the great majority, when, in speaking of these transactions, he says: "It is high time that the associations should bend their energies to the weeding process, regardless of the men or the positions they may occupy."

This matter, I am aware, has often been discussed by publication committees, and they have been unable to see clearly that this "weeding process," applied to the transactions of state societies, would at the present time at least result in the good of the societies from which they emanate, or of the profession at large. If this course was rigidly carried out by these societies, their annual volumes would shrink to very small proportions, and would soon cease to appear at all.

It would seem then that the only question to be determined is, whether these transactions, with the gradual improvement that will naturally follow in time, are of any value to the societies themselves.

Those who have observed closely the practical effects of these publications, feel convinced that they tend to stimulate individual effort among the members, who, having a personal and proprietary relation to them, peruse them with great interest, and thus is created a desire for more extended information upon the subjects therein treated, and they are led to seek for it in our periodicals and standard works.

If this be true, these publications have both a direct and indirect tendency to educate the societies from which they proceed. And if such transactions contain any articles of sufficient merit, they may be gathered into the periodical literature and made the property of the whole profession.

Besides, these full records may at least aid the future historian in determining the actual status of our profession at the times they were issued, and enable him to trace with certainty its advancement.

In addition to the transactions of these seven state societies, we have those of the American Dental Association, the Southern Dental Association, the American Convention, and the Odontological Society of New York, all of which possess more or less of a national character.

The latter society has issued two volumes of its transactions, which have appeared during the last two years. These proceedings bear witness to the energy and ability of this young association, and its reports take the foremost rank in the literature of transactions of societies.

By its constitution, the number of active members is limited to twenty. These are men of marked ability and residents of the city of New York, while the associate members embrace a large number of the leading men in the profession throughout the country, which gives to it its national character.

If the promises which were given in its two volumes of transactions are realized, it will, in the not far distant future, gain the same standing and influence in America that its namesake has acquired in Great Britain.

The transactions of the American Dental Convention have not been issued annually, only one or two volumes having marked its career. A portion of its annual proceedings, however, have been published in the monthly journals. Owing, perhaps, to the exceedingly liberal character of this organization, no qualifications for membership being required, the transactions of this body have not gained a very high rank in dental literature. While its meetings have been attended by many of the ablest men of the profession, few of them have given their best productions to its literary fund.

SOUTHERN DENTAL ASSOCIATION.

This association was organized in the year 1869. As announced in its constitution, "The object of this association shall be to promote professional and friendly intercourse; to develop dental literature, and encourage a high standard of dental education." Its membership, according to its constitution, consists only of dental practitioners who have received degrees in dentistry or medicine. From which it will be seen that this association requires higher professional qualifications for membership than any other in this country.

Whether this latter fact has proved advantageous to its literature, and whether the dentists, spread over the large extent of territory naturally embraced by this association, have been as much benefitted by this high standard required for membership as may have been anticipated by its originators, admits of considerable doubt.

The transactions of this society, if your committee is capable of judging correctly, do not occupy the highest place in this branch of literature, and hardly satisfy the high expectations that the friends of this association hoped to realize. Although committees of able men have been annually appointed to report upon the following subjects, viz: Dental Education, Physiology and Surgery, Histology and Microscopy, Dental Chemistry, Dental Therapeutics, Operative Dentistry, Mechanical Dentistry, Dental Literature, and Dental Pathology, very few of these committees have presented reports to the association.

This defect is partially, and only partially, made up by the voluntary essays, which possess about the average merit of those found in the transactions of our state societies.

To ascertain the cause of this, and to find a remedy, are important problems, not only to the association itself, but to the whole dental profession, who look to these transactions for their best literary efforts. These problems your committee will not attempt to solve, but in reviewing the transactions which have been issued from year to year, we have noticed that the members seem to lack interest in their association, very few of those who take part in one of its sessions being present at its subsequent meetings.

May not this to some extent be owing to the high qualifications required for membership, which must necessarily prevent the attendance of a large number of dentists, and thus make these gatherings comparatively small, and in consequence less enthusiastic?

The plan of admitting delegates without granting them the full rights of membership, seems not to have been effectual in preventing the above result. There may be other and various causes for the seeming apathy of the members, and defects in the literature of this body; but whatever they may be, one thing is certain, that these evils are not irremediable, for, it only requires an awakening of the energy and enthusiasm of its members, so eminently capable of remedying these defects, to place its literature in the proud position where it rightly belongs.

THE AMERICAN DENTAL ASSOCIATION.

In concluding this branch of our report we would briefly refer to the Transactions of the American Dental Association, and this we do with diffidence, and with considerable doubt as to how this literature should be treated.

It may be proper at the outset to premise that this association is composed of delegates and permanent members. Each local society throughout the country is entitled to send one-fifth of its members as delegates. Each of these delegates may, if he choose, become a permanent member. Now it is a well known fact that these local societies do not in all cases select from their numbers those of the most distinguished ability to represent them; for, being entitled to send more delegates than can attend this association, they confer certificates upon any of their members who may desire, or will accept them, without regard to their qualifications or fitness as representatives. For this reason, this association is made up of all classes and grades of the profession, and in consequence its literature takes a wide range, and represents hardly more than the average literary talent of the profession in America.

While your committee would not criticise the organic plan upon which this association is based, it is confident that the mediocral grade of its literature is owing in some degree to the carelessness or good nature of the executive committee, upon which devolves the duty of selecting the Standing Committees.

While the difficulties this committee has to encounter are fully appreciated—frequently finding the best qualified for these positions least willing to accept them—yet the fact remains patent that many of our most capable and representative members, for some reason, are not found on the list of "Standing Committees." For the reputation of this association and the credit of its literature, it is hoped that this fault may be, in a measure at least, remedied in the future. Indeed, that there will be a gradual but marked improvement in its future literature, must be an inevitable result; for the ranks of this association are now being filled up with young men, possessing high educational and scientific attainments, and who will infuse into its literature a more uniformly permanent value.

This association would secure a higher degree of respect, should the publication committee exercise a stricter supervision over its reports and discussions, and perhaps its usefulness, also, would be much increased thereby. It has matured and strengthened to such a degree that the tares may be rooted out without endangering the wheat, and perhaps with positive advantage to its growth.

And yet your committee would not recommend a very rigid course to be pursued in the culling and pruning of the reports of its proceedings for the printed transactions, lest this process, if too thoroughly carried out, should destroy that natural freshness and freedom which are the soul and life of all such associations.

In this matter the recent action of the "Odontological Society of Great Britain" may afford us a profitable lesson.

Until within a few years past, the transactions of that society contained only the choicest papers read before it. They now contain, besides these, the full report of the discussions of each meeting. Although their transactions are now perhaps less purely scientific, as a whole, yet the new arrangement, it is said, has achieved the desired object of increasing the interest of all the members of the society, and uniting them in closer bonds of friendship.

III. BOOKS.

No dental class books or works on dentistry have been published by American authors since the last report upon this subject. Indeed no work, except "The Student's Guide to Dental Anatomy and Surgery," by Henry Sewill, published by J. & A. Churchill, London, and Lindsay & Blackiston, Philadelphia, so far as your committee are aware, has been issued during the past year in any country.

"The Student's Guide" is a neat duodecimo of two hundred pages, and is deemed worthy of special notice in this report. Although, as its modest title would indicate, it seems to have been chiefly designed "to facilitate the labors of the student," yet, in the opinion of your committee, it contains too much valuable information to allow it to be monopolized entirely by the class of readers for which it was mainly intended.

On a somewhat careful perusal of this work we are quite favorably impressed with its general merits, and believe the number of dentists is small that will not be profited by its perusal.

This work is written under the following headings: "Anatomy and Histology of the Teeth," "Development of the Teeth," "Malformation and Irregularities of the Teeth," "Caries," "Treatment of Caries," "Exposure of and Diseases of the Pulp," "Dental Periostitis," and "Alveolar Abscess," and ten others, which it is not necessary to name here.

While the writer claims little originality for this work, he has evidently searched the best and most recent authorities upon the various topics treated, and has so arranged his matter that facts follow facts in such direct and natural sequence, encumbered by so few divergent theories, that the reader can find no difficulty in clearly understanding and retaining his meaning. In fact we seldom find a work of this kind less faulty in its literary style.

The treatment of all these subjects in a 12-mo volume of two hundred pages must necessitate great brevity, but the author performs much more than he claims for this work in the preface, where he says, the work is designed "to lead the reader to desire and direct him in seeking the fuller knowledge afforded by more extended treatises."

His article on the "Development of the Teeth," though brief, is well illustrated, and is a summary of the work of Messrs. Legros and Magitot, the latest monograph issued upon that subject by those physiologists. In fact he has drawn from all the sources at his command the latest and most reliable information that could be gained upon these subjects. And yet this little work is not entirely free from defects. For instance, under the head of "Treatment of Irregularities," he says, "When the direction of the canine is correct, it will in time take its proper place if room be afforded, but should it appear in an oblique direction, and its roots lying at an angle across the alveolar border, as in the case depicted in figure 27, it is unlikely that it could be brought into the desired position, even were mechanical treatment employed. In such cases the extraction of the misplaced tooth is the sole resource."

From the author's description of this case, and from the diagram illustrating it, this irregularity is by no means a very unusual or difficult one to remedy, and even if it were considerably worse than depicted, the practitioner who would extract such a tooth, would be justly deemed guilty of gross malpractice.

Happily this is the greatest error observed in the book, and one that would not be likely to mislead the practitioner, though it might the inexperienced student.

Under the same heading the following singular passage is found, viz.: "That the movement of teeth under the influence of pressure must be accompanied, in *some instances*, by absorption of bone, is beyond doubt, but from the fact that the opportunity for post mortem examination never presents itself during the treatment of these cases, the exact mode in which the changes in the tissues are affected cannot be ascertained, and *for a similar reason it is impossible* to explain the well known circumstance that, even after the absorption of bone *has been apparently* induced, and the teeth have taken the desired positions, they tend invariably to fall back into their former situation, unless mechanically fixed by the teeth of the opposing jaw, or retained for a considerable time by an instrument constructed for the purpose." (The italics are my own).

If your committee understands the meaning of the above passage, the author of this little work finds it "impossible to explain" some physiological facts which we had supposed were simple, and generally understood by the profession.

The treatment of the subject under the head of "caries" is excellent and quite thorough.

"The treatment of caries," though in some minor details differing from the views generally entertained in this country, is in many respects admirable.

In his preventive treatment he however recommends tooth powders composed of *strongly alkaline* bland and soluble substances, having no more mechanical power than enables them to remove the well known soft fur which coats the surface of the teeth in most mouths."

Your committee had supposed that precipitated chalk was equally efficacious as ant-acid, and that it was less liable than strongly alkaline powder to affect injuriously the structure of the teeth.

The author however afterwards says that "the desired objects are as well fulfilled by a mixture of precipitate of chalk and soap."

The portion of this chapter which treats of filling teeth is, in some respects, the best your committee has seen in any treatise upon that subject, and the illustrations are new and, in our view, in many points, superior to anything heretofore published.

The article on "the exposure of the pulp," and "diseases of the pulp," is good, though in the conservative treatment of the exposed pulp our own practice would differ somewhat from the views therein expressed. It must be confessed however that there is a variety of opinions on this subject among our ablest practitioners.

The author favors the filling of root canals with oxychlo-zinc, in preference to gold, believing it less liable to produce periostitis. This is a matter of opinion upon which the profession may be found divided.

There is a sentence under the head of "Diseased Pulps," which strikes your committee as being remarkable. It is this: "In cases in which there has occurred an outgrowth of new tissue sufficient to constitute a polypus, the extraction of the teeth is the sole treatment that can be recommended." This needs no comment.

The treatment of alveolar abscess is, in some respects, incomplete and unsatisfactory.

We need not occupy your time further in noting the imperfections, or what your committee believe to be imperfections, in this work, which are really not numerous. It is an easy task to find flaws in nearly all works of this nature. Notwithstanding the few blemishes that mar the perfection of this production, it is on the whole a work of genuine value, both for the dental student and the average practitioner.

"AN ANATOMICAL DESCRIPTION OF THE PERMANENT TEETH."

Your committee is in receipt of the advance sheets of a little monograph with the above title, by H. Judd, M. D., D. D. S.

A few words from its preface will give the association a better idea of the object of this work, than can be done by your committee in a hasty review of its contents.

In this the author says: "In all the anatomical descriptions of the teeth found in the text books, many of the most important points, such as a description of the fissures, sulci, fossæ, ridges, pulp cavities, etc., have been almost entirely ignored. A description of these being entirely new, in many respects, necessitates new names for the parts which have not been named before, and in this little work many new names have been added; but we have been careful to follow accepted nomenclatures when that was possible, and to follow analogies furnished by them to guide us in the selections of words altogether new.

"We have followed John Tomes in naming the surfaces of the teeth, as we consider his method the most concise and convenient of any yet used, and more generally adopted by the profession than any other; and we have followed Gray's Anatomy in giving distinctive signification to the terms 'root' and 'fang,' which," he continues, "accords * * with the evident tendency of the language for some time past."

That one branch of our literature has suffered for the want of a settled and distinctive nomenclature that will define with accuracy every portion of the teeth, there can not be the least doubt. In supplying this deficiency, the author of the treatise under consideration has encountered many and serious difficulties.

To describe each portion of these organs, which have neither symmetrical nor geometrical proportions, in clear and concise terms, which will readily and certainly convey to the mind of the reader and hearer the precise spot or point referred to by the writer or speaker, requires much patient labor and philosophical study of the languages.

That the author has faithfully and ably accomplished this work, the name it bears, and the action of the St. Louis Dental society, by which it is published and illustrated, would seem to be a sufficient guarantee.

Such a treatise, fully and systematically describing the teeth, will be particularly valuable to our literature on the branch of operative dentistry.

How often, while listening to discussions in our Dental Associations, have we been surprised by apparent diversities of opinion, which really arose from a want of proper and definite terms to describe clearly the different portions of the teeth.

It must be a remarkable work, indeed a superhuman production, that will entirely accord with the judgment and taste of every individual, where such an infinite mental diversity exists; and all the descriptive terms used by the author of this treatise may not meet the unqualified sanction of the whole profession. Yet we have observed but perhaps one of these, which seems to us particularly objectionable, and that is the use of the term "fang," to designate the branches or divisions of roots. For example, he

says, "The root of a superior molar is divided into three fangs, two labial and one lingual." "The root of a lower molar is divided into two fangs, a mesial and distal."

The etymological grounds upon which he bases this use of the word are apparent, but to our minds they do not fully justify such use; but if this term is to be retained at all, it is far better to use it in this distinctive sense, than as a synonym of root.

To the teeth anterior to the bicuspids, he never applies the word fang, but invariably calls them roots.

Gray, whom the author follows in naming these parts of the posterior teeth, seems to have made the distinction not intentionally but by accident. For, in describing the different portions of the incisors, he speaks of the "crown," "neck" and "fang," while he describes the canines as having a "crown," "neck" and "root."

This distinction in terms seems to have been premeditated, since in the one case the word "root," and in the other "fang," is the only subject of a paragraph, and is emphasized by the use of italics.

Why incisors should have fangs while the canines have roots, Gray fails to explain, and it is too deep a philological question for your committee to solve.

If they are not convertible terms, one or the other must have been improperly used, and if they may be used interchangeably, he might with equal propriety have said in his description of the molar teeth, "The fang is subdivided into from two to five roots," as to have said, "The root is subdivided into from two to five fangs."

So much for the medical authority which has accidentally given to the author of this treatise only a clew to a system which he has perfected and adopted, in giving a distinctive signification to the terms "root" and "fang."

Whatever may be said concerning the propriety of this latter term, as used by the writer of this treatise, all must concede that he has used it definitely and methodically, and in a more rational sense than has heretofore been given to it.

If this work shall be found defective in a few minor points, still your committee is fully satisfied that the author has done what no one has ever done before, in giving us a clear and concise anatomical description of the permanent teeth, which will be readily comprehended by the average intelligence of dental students.

TOMES.

Since writing the above, and only the day previous to leaving home,

your committee has received some advance sheets of a work on "Dental Anatomy and Physiology (Human and Comparative)," by C. S. Tomes.

The preface I have not seen. It will be a crown octavo volume of considerable size, judging from the sheets in our hands, which run from the 99th to the 146th page, and contain chapter IV.

This chapter is devoted to the development of the teeth of Fishes, Reptiles and Mammalia. In this the author shows the essential characteristics that are common to the different groups of vertebrates.

He says that "prior to any calcification, there is always a special disposition of the soft tissues at the spot where a tooth is destined to be formed." * * "All or a part only of the soft structures making up a tooth germ become converted into the dental tissue by a deposition of salts of lime." * * "The tooth is not secreted nor excreted by the tooth germ, but an actual metamorphosis of the latter takes place, * * at least of some portions of the tooth germ." * * "The three principal tissues, namely, dentine, enamel and cementum are formed from three distinct parts of the tooth germ."

"The 'follicular,' 'papillary' and 'eruptive" stages" into which the process of tooth development has been heretofore divided by anatomists, "are based upon a false conception—upon theories now known to be incorrect."

The author bases his account of the development of the teeth of man and mammals upon the researches of Kolliker, Thiersch and Waldeyer; that of reptiles and fishes to some extent upon those of Huxley and Santi Sirena, but principally upon Hertwig's and his own.

These conflict with the theories published by Professor Owen.

"Tooth germs," the author says, "are never found upon the surface, but are always situated a little, and sometimes a considerable distance beneath it." "Every known tooth germ consists in the first instance of two portions, and two only—the enamel germ and the dentine germ—and these are derived from distinct sources. * * "

After elaborating these points he takes up the development of the teeth of the Elasmobranch fishes, followed by the Teleostei or Osseous fishes, then the Reptiles, then Mammalia, describing each with minuteness and clearness, and illustrating the same by numerous and finely executed engravings.

This view of the comparative development of the teeth is not only interesting and instructive of itself, but gives the reader a far clearer and deeper insight into the processes of development of the human teeth.

The above is a very defective and crude summary of a portion of one of

the chapters of this work, but it is to be hoped that it may give the association some insight into the character of this forthcoming volume.

To dwell upon the literary merit of this work, or upon its highly scientific character is needless; in this respect the reputation of this young author is already too well and favorably known to this body to require commendation from your committee.

We would simply say in closing this part of this report, judging from the single chapter before us, this work excels both in its literary and scientific character, and in the magnitude of the researches of its author, anything that has previously emanated from his pen.

Your committee would therefore congratulate this association, and the whole dental profession, upon the speedy advent of this volume, which will not only prove a great accession to dental literature, but will supply a want which has heretofore been felt by all of us.

This work is to be reprinted by Lindsay & Blackiston.

HISTORY OF DENTISTRY.

Since the commencement of this session, there has been handed us a work entitled, "A History of Dental and Oral Science," prepared under the direction of "The American Academy of Dental Science," and published by S. S. White.

(We would remark incidentally that this is the only work which has been furnished your committee by either the authors or publishers).

This is a neatly gotten up royal octavo volume of 270 pages. From a hasty glance at this work it seems to be a valuable one, especially as a book of historical reference.

In its preface we find the following: "The effort has been to make the work strictly historical, and in no sense didactic. * * That most of its contents will be thought worthy of a place in history, and that it will prove of interest to the present generation, in enlightening them as to the work of their predecessors, and that it will be of value to the historian and essayist in directing him to sources of information, and as a preservative of the fast vanishing facts of the earlier days of American Dentistry, is fully believed."

While your committee believes the above to be strictly true, it also believes, from a cursory examination of its contents, that it is in many respects incomplete; but nevertheless, we believe the compiler has produced a commendable work, and one that will give the profession much information never before brought within their easy reach, concerning the rise and progress of our specialty, and which has been collected by "The American Academy of Dental Science," at great expense, and doubtless with equally great labor and care.

VOLUNTEER PAPER

ON

DENTAL LITERATURE.

BY W. H. DWINELLE.

Most if not all of the real progress in our profession within the last hundred years may be practically embraced in the past fifty, nor till within the last twenty-five could it claim to be recognized as an established science, taking its place among the standard institutions of the world. To-day it is pre-eminently so.

Our profession, having for its aim the restoration, preservation and establishment of man, recognizing his immortal as well as his temporal nature —already "but a little lower than the angels; realizing that a sound mind could not exist within a diseased body, and seeing through the teachings of science that he is a microcosm of all the elements and principles of nature, it will be readily conceded that to preserve the whole in one, all that there is in art or science, and everything that can be conceived of by the human mind, may be made practically tributary to him to that end. The whole science of medicine and surgery as then understood, and all other known agencies, were brought into requisition to stay the tide that we found charging against us; even then we found ourselves but poorly prepared for the contest, and hence we early realized the necessity of creating and maintaining a new science, that should be continually expanding in its character, to meet the great exigencies before us.

A noble army were our predecessors, who responded to the call, and laid the foundation for the redemption of our people. The scientist, the physician, the educator and those of other professions, abandoned their own

callings to join and co-operate with us in our larger field, larger promise and larger philanthrophy.

The work of building up the superstructure began; it must be established upon the basis of true science; all art must contribute to it; it must be endowed with a true educational system; it must have its journal as an organ, and its literature, before it can take its place among the recognized institutions of the land.

How far we have succeeded, our annals and our achievements will show.

The necessity of systematic education being conceded as one of the first essential steps to our progress, measures were taken for the establishment of a Dental College, that should not only be educational but representative in its character.

Permit me here at this time to give an interesting account of the origin of the first, the initiative dental college of the world. It is embodied in a letter to me from Dr. H. Willis Baxley, one of the original corporators, and a member of the first faculty of the institution referred to above.

"LONDON, Sept. 29, 1874.

"*Wm. H. Dwinelle, M. D.*

"DEAR SIR—You ask me to write what I said to you some time since, about the where, when and how, and on whose motion, systematic instruction in dental surgery originated.

"Pressing engagements at this moment allow me to say but briefly, that in the summer of 1839, in the city of Baltimore, when I was engaged in the practice of medicine and surgery and in teaching anatomy, Dr. Chapin A. Harris, a practicing dentist in the same city, called on me and asked my co-operation in an attempt he proposed to make, to lift dentistry from its condition of a merely mechanical pursuit, of destructive rather than preservative tendencies, and give to it higher claims to rank as a legitimate branch of conservative surgery.

"Some years before that time Dr. H. H. Hayden, also of Baltimore, had delivered to a few medical students of the University of Maryland, some lectures on dental physiology and pathology. I was one of his class, and found the lectures very speculative and unsatisfactory. Certain it is that those engaged in tooth pulling, filing and filling, which then seemed the sole business of the craft, took no interest in Dr. Hayden's attempt to enlighten them. Nevertheless he is entitled to credit for an effort, however unsuccessful, to give dentistry better claims to public confidence.

"Dr. Harris' scheme was altogether more comprehensive, better fitted to draw to it the attention of those engaged in the practice of dentistry, and had a great advantage in being proposed and pushed by a man of deep con-

victions of duty, and of extraordinary enterprise, industry and self-sacrificing character. It contemplated the obtaining a legislative grant or charter to teach and confer the degree of Doctor of Dental Surgery. At the session of 1839–'40 of the Legislature of the State of Maryland, that enlightened body through the personal solicitation of Dr. Harris and myself, passed an act of incorporation of the Baltimore College of Dental Surgery, with the faculty herein named, viz.: H. H. Hayden, M. D., Prof. of Physiology and Pathology; H. W. Baxley, M. D., Prof. of Anatomy; C. A. Harris, M. D., Prof. of the Theory and Practice of Dentistry, and Thos. E. Bond, M. D., Prof. of Therapeutics. It is a pleasing record for the medical profession to look back upon, and see that all engaged in this movement were graduates of medicine, and had drank of the streams of progressive science from her fountains. The practical inauguration of the new college presented a difficulty well known in America, where professors often outnumbered students. At length five legitimate students of dentistry were found to covet the honor of the new title, D. D. S., and the first course of instruction was given in the winter of 1840–'41. The didactic lectures were delivered in a small room, publicly situated. But the teaching of practical anatomy demanded privacy, and other prudential considerations also suggested the use for that purpose of a secluded stable loft.

"It was not the first time the modest place of a manger became the scene of an event leading to infinite results. And, looking to the vast achievements in dental science following the stable loft beginning, the statement of the fact may encourage others in their day of small things hereafter.

"Participating in the early efforts under difficulties, giving practical shape to Dr. Harris' suggestions, I have been astonished at the marvelous results which in one-third of a century have flowed from them. An invalid tourist in foreign lands whither I have gone, I have found American dental anatomy, physiology and pathology, therapeutics, operative and mechanical appliances, supplanting the ignorant notions and destructiveness of olden usages, which have long clung even to European civilization.

"And American dentists themselves are welcomed and cherished as the originators and bearers of coveted blessings. By their influence dental associations, institutions and investigations have had birth abroad, and ere long, especially in Great Britain, Americans may expect to find rivals enter the lists with them in all that relates to this department of knowledge. Let me add my opinion, that unless American dentists check the tendency to deterioration now apparent in collegiate education, and raise the standard of preparatory and final qualification, as tested by thorough and impartial examinations, England will probably soon and justly claim first rank in dental honors—she is trimming sails evidently to that end. But whatever issue may come in that direction, it is certain that Dr. Chapin A. Harris, of

America, originated the measures which have brought to us all a great boon. And it has often surprised me when witnessing and reflecting on its wide application to the wants of mankind, that his countrymen, especially those who through it are coining wealth over the wide earth, should have neglected to manifest their appreciation of his merits, and their gratitude for his great services. Very truly yours,

"H. Willis Baxley."

This and subsequent institutions were fostered, cherished and endorsed by such worthy men as Parmly, Brown, Hayden, Harris, Flagg, Tucker, Harwood, Gardette, Townsend, Maynard and others—a noble array of brilliant, large-hearted natures, who as men of science, artists, poets, men of letters and cultivated gentlemen, would grace any circle and adorn any age.

The American Journal of Dental Science was established about this time, and was for many years the exponent and acknowledged organ of our profession; its pages were graced with contributions from the pens of some of the most distinguished writers of the country, not only within but from outside of our profession. In some instances men who are now of pre-eminent distinction as physicians and surgeons, made their first *entree* into the world of special literature through the pages of this Journal. Throughout its entire career, closing with the death of its chief editor Dr. Chapin A. Harris, one of nature's noblemen, the profession's foremost friend and benefactor, it was ably conducted, and took rank among the best quarterlies of the country, and to this day the young devotee of our art will be astonished to find how much that is new and interesting he will find on perusing its pages.

As we were dealing with the ultimate, and the laws which govern all forms of organic life, the microscope has been our invaluable aid, and among our numbers to-day will be found some of the best microscopists of the age. Through it the science of histology has been established in our own day, contributing abundantly to our profession as well as to others.

The study of the elements and the subtle agencies lays hold on chemistry, and no devotees have excelled those of our profession in this department—many of whom are distinguished, and regarded as authority in this specialty.

The profession of dentistry was made a necessity in consequence of the medical profession neglecting and practically ignoring the teeth and their functions, and all their direct and reflective relations to the human economy. So far from pointing out means and measures to preserve these organs from future destruction, they had adopted a succession of methods that were merely temporizing and palliative in their character, and by a series of inverted chemistry and dietetics, had not only virtually destroyed the teeth of

generations by robbing them of their rightful primal elements, but had projected their destructive tendencies into every avenue of the sacred citadel itself. So that as a people we had become physically, proverbially degenerated, and it became almost a question to benevolence and wisdom, whether if the standard of humanity fell much lower, the race would be worth perpetuating.

At this stage of the world's history, our own profession, born of the age's great necessity, came to her succor and relief; while she was struggling under sorrow, pain, weakness and degeneracy, the penalty of her broken laws, God in his mercy silently yet manifestly proclaimed, as he had done before, that again "the fullness of time" had arrived, when the world's needs were imperative. And, through His inspirations up sprung an army of inventors, of prophets and high priests, to restore, redeem and bless our people.

In the language of one familiar to you all:

"The medical world, for want of the knowledge of minute anatomy, neglected to study the character and significance of the teeth, till from sheer necessity men sprung up to remedy the wholesale loss which was fast coming upon the people, of their masticatory organs.

These men began to look into the origin, development and decay of these neglected parts of the human body; and these studies have revealed the cells as the factors of function, and as the elements of tissues which are the seat of nutrition, healthy and unhealthy.

And thus from the sins of omission of the medical profession, was born the dental profession, who are now busily engaged in remedying the mistakes of their predecessors, whose chief result of their influence upon the race has been to shorten life by patching up poor constitutions, that, but for nursing and care, would never have come to maturity to propagate their deficiencies through their offspring.

A true benevolence would never have permitted this spawning of progeny that were poorly begotten, imperfectly gestated, and born tired and worthless into this world of work and worth.

We have recognized that the mouth was practically, as well as figuratively, the very door-way of life—that here, preparation for nutrition and elementary vitality began, and that what was appropriated and properly manipulated here, through the processes of mastication, comminution, masceration and insalivation, would subsequently be assimilated into cell-building, and, progressively into man, brain, mind, and soul-building to its highest normality.

We stand as sentinels and watchmen at this sacred portal, to guard and to defend, in the light of all of the errors of the past and the inspirations

and teachings of the hour, to help physical, mental, moral, and with it spiritual humanity, upon her feet again to her loftier and lost standard.

Think of the many ways in which we have contributed to the happiness and prolongation of human life. Our treatment, as a rule, is neither experimental nor palliative, but *direct* and *sure*, and is rapidly approaching the standard of an exact science.

Starting with the infant in its cradle, our art, if duly applied to, is capable of staying, to a large degree, the tide of death that heretofore overwhelmed the helpless subjects of teething.

We minister to enfeebled children, and exempt them from long vigils with disorganizing pains that would have undermined their feeble natures, and would have crushed them to the earth; or, we ensure them a normal denture and healthy functions, by which they are enabled to vivify themselves over the dangerous chasm that lies between youth and manhood.

Our patients of mature years are oftentimes diverted from acute and chronic disease of the most alarming nature, by generous and special operations on the mouth, together with general treatment.

Diseases of the gastric membranes are largely modified by treatment that comes from the dentist's hand alone.

Nothing is more common than to have that "king of terrors," dyspepsia, which underlies so many other causes to drag humanity down to the dust, take his departure permanently and forever when the renovating hand of the intelligent and thorough dentist has cleared out the vitiating sources of acrid and poisonous secretions that lay brooding and festering in the patient's mouth, and then restored his organs to their primal usefulness.

It is not uncommon to find well marked cases of progressive consumption yield to the treatment that is directed to the buccal cavity alone.

All of the diseases incident to the superior and inferior maxillary, including those of the antrum, we claim as our own special field of labor, and we have already become acknowledged authority and teachers in this department; here the medical and surgical profession have bowed to our superiority, and are glad to sit at our feet and learn wisdom.

To old age we insure all the functions of mastication and assimilation as in their youth; we preserve the contour, keep the type, obliterate the peculiar marks of age, preserve the voice intact, and place the stamp of rich maturity where otherwise would be feebleness and dilapidation, and, by a judicious husbanding of forces, project their lives into a decade or two beyond. I am, of course, speaking in a comparative degree; but the essence of the truth is nevertheless the same.

As a part must ever be holden to the whole, and as we stand at the very

threshold, through which the stream of vitality has its rise and flow, whatever treatment shall result in a beneficial organic change to the teeth, must be shared by the whole system at large. If you infuse new earthy elements into the teeth, they must be extended to the bones generally, and the same tonic influence that was designed to localize within the tooth, is disseminated through and invigorates the whole system.

We seldom see an old man, now-a-days, of the olden times—

"One whose nose is thin
And rests upon his chin
Like a staff;
And a crook is in his back
And a melancholy crack
In his laugh!"—

with sunken cheeks and feeble and inarticulate voice. Our art has made them an almost extinct race, and the "toothless crone" is fast becoming obsolete.

Who can estimate all of these influences upon longevity?

Recent vital statistics, especially of the United States, recognize the great fact that the term of human life is gradually and surely becoming extended, without attempting to account for it.

It is becoming and right that to our profession the world is largely indebted to the change.

Our art deals with and has special reference to all which shall conduce to longevity. It is so generally practiced, so generally disseminated, and for such an extended period, that it is reasonable to expect that its influence should be marked and recognized, by this time. The entire teachings of our specialty makes us keenly alive, on the one hand, to every thing that shall promote the highest healthfulness and most extended vitality; and, on the other, to reject, to counteract and to overcome all invasions of the enemy, come in what destructive form he may.

We trust that before the next hundred years shall have passed away, we shall have so far diverted and overcome the cause of decayed teeth, that artificial teeth will, except in case of accident, neither be needed or known. We believe this may be among the possibilities of the future.

Though many of our dental colleges are indispensable to our art and its progress, and are doing a glorious work for it in the direction of dental education, yet none of them can ever make it complete, nothing will ever compensate for that general culture which comes from a larger and more extended course of study, and for those continuous and prolonged teachings, derived from the association of years, with the practical dentist at home.

In the language of another, "An exclusively dental education is an impossibility, for the plain reason that the processes of development, nutri-

tion, function, health and disease of any and every portion of the human system, must be understood to constitute the basis of any special manifestation of functional activity in any development or constituent of department throughout the whole range of the organic relations of the system to which they belong, and of which they constitute a part. Dental education then consists in a thoroughly complete classical course, and then a medical and surgical education, to which a concise knowledge of the teeth should be added, and then only have we attained the true type of a dental education.

"The head, heart, and then the hand must be educated, if we desire a dental education worthy the transcendantly worthy position of a christian dentist."

I have already intimated what the dentist of the future should be. Having inherited so much, and being the custodian of so many talents, as well as the very honor of our profession, he will be recreant to his trust if he does not elevate and adorn his profession and exalt himself into the man *par excellence*.

All process of development of the planets and inhabitants of planets, goes from the general to the special. And special expression of complete development ever holds the culminated values of all of the steps and stages of the career, from inception to completion of productions of bodies or processes.

In like manner, we should look for the dental profession to be the special embodiment of all philosophy, science and art, it being the last upheaval in professional bodies.

In like manner the highest mountains are of the latest and most pronounced upheavals of the earth's crust, holding all the strata from the lowest to the highest, in which a single section reveals the whole order of form and development. In like manner ours should be the culmination of all sciences.

It is the glory of our profession that it yields opportunities for high and refining culture; we are continually associated with and have to do with the best of our race, with everything that is calculated to stimulate, to furbish up all of our powers, whether physical, moral or spiritual, to their highest capacity. Unlike most professions, we command leisure which they know not of, by which we have enviable advantages over them.

In conclusion, gentlemen, where in the long round of professions, arts and sciences, can be found one which is surrounded with worthier or more abundant influences, and which may contribute more toward the formation of the man for all time, than is ours? We should be co-workers with poets, historians and statesmen, "with the lovers of the true, the just and the useful; with the searchers into the mysteries of unwilling nature, making the winds and waters, the palpable and impalpable essences of things tributary to man; creating new gratifications for the body, and developing new capacities in the soul!"

REPORT OF THE COMMITTEE

ON

DENTAL EDUCATION.

By W. H. MORGAN, Chairman.

The last century of American development is remarkable for nothing more striking than the progress of dentistry.

Its sister branches of surgery laying claims, as they did, to the talent and energy which, as immediate necessities they evoked, had left dentistry far in the background, to await those social advancements from which the indications for its development must ever spring. And there is nothing which more clearly indicates the character of American civilization than the birth and rapid growth, within the last century of American freedom, of a science so necessary to social and personal comfort and well-being. Growing thus rapidly into collossal proportions and relations, it becomes at once a question of vital interest as to the nature and character of the development which shall mark its future history. Up to a late date, whatever of progress it had made, was due almost entirely to individual energy, industry and effort. The enthusiasm of its devotees has been the palladium of its strength and growth. But its developments have become too expanded, its appliances too extended for individual skill, however zealously applied. Disintegration of effort, at the present stage of development, would prove utterly paralyzing to its further progress; concentration of effort is the watchword of the hour that ushers in the Centennial year.

We have reached a period of time when the work of accumulation is even more important than investigation, and the manipulation of materials of more importance than their evolution or production. We are in danger

of having the pathway of progress blocked up by the very piling up of disintegrated or separate facts. We need arrangement, classification, order; and this is not the work of an individual, but of an organization.

The preparation of material for proper assimilation, in the mind of the beginner, is, or ought to be the first office of the teacher, and it is to this work that it behooves the men and institutions which stand out as the exponents and teachers of dentistry to address themselves earnestly and energetically at the present time.

Dentistry, in its every essence, is part and parcel of general surgery, and like all other specialties, should be developed *pari passu* with the various branches of learning and science which enter into the formation of the general science. These several branches cohere by virtue of those broad principles which run like threads through the ever crystalizing beads of facts, and it is only by this concentrating, this centralization of facts, that they can ever be seen in their true relations.

Whenever dentistry degenerates into a mere system of convention, independently of those general and fundamental principles which fix its true relations to general surgery, its doom as a science is fixed and sealed. The shop windows of the great metropolis of the old world, (and of the new, too, for that matter), filled with the tools of the tradesman within, and the ticketed rates of his labor, afford us a lamentable example of the divorce of dentistry from general surgery and honorable medicine. The high standard of some of our schools of dentistry has done much towards professional elevation, as well as the material development of the science. But our work is incomplete. While the professional relations between the graduate of medicine and the graduate of dentistry are pleasant, it is useless to deny that they are not yet what they should be, nor will they be until dentistry shall have become enrolled under the colors of general surgery as part of that organic university system, which experience has demonstrated to be the only true basis of systematic education.

Am I going too far in the spirit of reform, when I say that the degree of D. D. S., or D. M. D., should never be conferred, except as an appendage to the broader degree of M. D.? Have we not the same right to the general title of M. D. as the ophthalmologist and aurist, and are there not the same cogent reasons that we should possess it? Are the relations of ophthalmology and otology with medicine more intimate than those of dentistry and general surgery? Not at all; and we surrender what is our just and equal right when we give up the broad bearing of the one title for the contracted signification of the other. It is useless, in a report like this, to prate of the standard, or of any of the details of dental education. These things regulate themselves, to a large extent, for colleges, like liquids, will arrange themselves in the order of their specific gravities. It belongs to us, on this

occasion, merely to mark out the general bearings of dental education and determine its true relations.

In comparing English and German universities, Mathew Arnold has well said that in the latter the effort of the university is to bring all that is possible out of a man (educo—education, leading out), while in the former it is to cram all that is possible into him.

To apply this sage remark to dentistry, we think that in the development of our school system America, should strike the happy mean between the two. The science of dentistry is teeming with facts; these are to be collected, classified and presented in order to the mind of the student, while at the same time there should be given to him that impetus to original research, which only an enthusiastic appreciation of these facts can impart. We have no system to offer beyond that afforded by the general university. Here, the contact of mind with mind in the different fields of research, does much to stimulate individual energy, and to direct individual thought.

As there is no one truth in this great universe of God that is not connected with every other truth, so there is no science that does not interdigitate with every other science in the grand evolution of thought. We have our part, and a great one it is to perform, in this great work of development. Our past may challenge boldly the criticism of the world. But ours is not a positive science; new processes, new relations, new methods are constantly being evolved, and the work of classification is vast indeed. The countenance and support of the world is already ours. To-day, our science is regarded as one of the most prominent landmarks of civilization, and the demand for its development is growing more and more imperative each day. Let us not disappoint the hopes which have been raised, but through energy and wisdom carry the standard of our science into the very vanguard of human progress.

VOLUNTEER PAPER

ON

DENTAL EDUCATION.

By E. WILSON, Havanna, Cuba.

Mr. President and Gentlemen of the American Dental Association:

The subject of the paper I am about to read is one that is and must ever be of capital interest to the profession.

It is by no means novel; indeed, it has been frequently and variously discussed in this and other bodies of our members; but so far as I am aware, we have not yet reached, through such discussion, any definite or even proximate accord.

These conferences have been instructive, as showing how widely the need is felt for some shaping modification in the plan of our educational body, and the wide diversity of ideas developed serve to demonstrate how great and pressing is this necessity.

Also the subject comes before us with a peculiar interest at this particular meeting, which is in some sense the Centennial anniversary of the existence of our art, equally with that of our political existence as a nation, and, therefore, is a time of retrospective examination of the road already traveled over, and of high resolves as to our future course.

There has been a good deal said of late in regard to our status in the estimation of the public and that of other professions, and of a supposed tendency to depreciate the eminent services we have rendered and are rendering to society. I think, therefore, we owe it to ourselves to consider calmly and fairly the exact quality and quantity of the merits acquired and

for which we claim respect; as, also, the most effective methods of augmenting those merits.

One of these will be by raising the largest numerical proportion of those already in our profession to a high standard of excellence, and to discourage, as far as may be, the entrance into it of those of inferior grades of preparation; because such men must count for their full numerical weight in any general estimate of our quality.

Those disposed to complain of our present status should not forget that it must be determined by the aggregate quality of the profession as a whole, and not by that of our best men; and also that in any comparison of status with other professions, the question of *general culture* must inevitably enter as an influential element in such comparison.

Whether we are and ought to be considered as medical specialists, I think will best appear after a thorough consideration of certain points, on which it is the object of this paper to provoke discussion.

Before proceeding, however, I desire to file as a caveat to guard against misconception, the statement that in any criticism I may make upon our profession, I make it as a dentist trying to look the facts squarely in the face, in the interest of his chosen profession and in the kindest fraternal spirit.

Now has a profession or art, whose professors in the United States alone number at least eight thousand, and of which about one thousand have been graduated by the dental schools, and perhaps one hundred by the medical colleges, few more of which have received any degree, either literary or scientific, any reasonable grounds for claiming equal status with a profession, the whole body of which, with few exceptions, have had the greatest advantage of regular literary and scientific training and graduation?

No one of us who has been more than a quarter century in ours, and is familiar with its history, will have failed to recognized how exclusively its origin and development have been in obedience to the natural laws of demand and supply, acting upon an enterprising people of peculiar mechanical tact and perseverance.

At an epoch when extraction was the chief remedy for decaying teeth, it resulted that more of these organs were sacrificed and lost than in modern times, and its effects upon personal comfort and health did not fail to force themselves upon the attention of practical experience and progressive physiology, and these gave rise to attempts to compensate their loss by artificial substitutes, and to arrest their decay by plugging.

We can now look back upon the record of a century, and with honest pride challenge comparison with any art that competes with us in this cen-

tenary year. Indeed, this pride is shared with us by the nation at large, as one of our peculiar and most brilliant national developments.

No art has surpassed ours in the enthusiasm with which it has been cultivated; none in the variety and cunning of its methods, instruments and machinery; none have advanced more rapidly in the value of its services rendered, and in consequent public esteem, which on the whole I think has fully kept pace with our increasing usefulness.

Do not forget that I speak of aggregates.

Now, what is the exact quality and limit of our services to society up to the present time?

Taken in the aggregate, I trow that no fair and clear mind will fail to see that they have been almost exclusively mechanical—chiefly limited to the mechanical operations of plugging for the arrest of decay, and the replacing of those lost by artificial substitutes. The merits we have acquired with society by the efficacy of these services are unquestionably great, and duly recognized by the more intelligent of society.

Taking as samples the work of our best men, we have perhaps reached a degree of excellence that we may not be able greatly to surpass as regards those cases which are uncomplicated by marked pathological conditions of the pulp or other soft tissues; but as we are dealing with aggregates, I apprehend we have still ample road before us, in order to bring the profession up to that standard of excellence.

In this however we are making fair progress by the means at present in operation or in prospect, and for the purposes of this paper we may pass to the all-important question: How may we augment our usefulness to society?

From supplying substitutes for lost organs and preventing or retarding such loss, our power to save has extended to most cases not complicated by pathological conditions of the soft tissues.

Now, what field lies next to and immediately before us in the direct line of our development, and through which we must necessarily extend?

Clearly it is the treatment of those pathological conditions of pulp and dentine and contiguous tissues inseparable from dental diseases, too often involving the loss of those organs, and in regard to which the most intelligent are still groping in the morning twilight.

We are here face to face with therapeutical problems which concern some of the most delicate tissues of the human body, complicated by most unfavorable relations to hard tissues, which greatly augment the severity of disease and the difficulties of its treatment.

This, gentlemen, to my apprehension, solves the question as to whether we ought to be medical specialists.

As to whether we are now such, as a body, in view of present acquirements, I doubt if it can be fairly claimed for us.

It is irrelevant to consider whether the average dentist or physician of the day has most intelligence for the treatment of dental and oral disease.

The physician has little or no contact with, and consequently little or no opportunity for, systematic observation and study of it, while the dentist is in direct and constant contact, and by force of habit acquires a certain amount of practical tact in its simpler forms, but lacks the indispensable qualifications for its successful cultivation as a science.

The physician having these qualifications, lacks the opportunity, and thus is behind the dentist in this matter. The one has the preparation without the opportunity, the other the opportunity without competent preparation.

The question is not, therefore, whether we are to encroach upon ground already occupied, but whether we are to blunder on blindly in a new field directly and exclusively in our line of development, or are we to enter it with such qualifications as will secure the best possible results to society

In our progressive development we have now reached a limit beyond which science must open for us the way. We must educate and organize for this a sufficient body up to the front rank of what science has already demonstrated in anatomical, histological, chemical, pathological and therapeutical laws, make them familiar with all the best scientific methods, and well disciplined as to how and what to observe.

In this way we will, after ten years, have accumulated a fund of demonstrable facts, which will enable us to develop upon a sure progressive basis, and settle the question of our professional status.

The time has gone by in which science was constructed from theories alone, securing only such facts as conform to these. We know to-day that theories are only the staging which assists us in raising the edifice, which must be of solid facts or it will not stand; these stagings each time to be varied as a new elevation is reached.

Hitherto in our discussion of dental therapeutics, I fear that our stagings have been out of just proportions to the building materials accumulated. These stagings have been formed in great variety and ingenuity, but many granite blocks are still to be quarried before our edifice can go successfully forward.

To those who would ask me why our medically educated members have not made greater developments, I would answer, that isolated individual efforts seldom make rapid progress; well instructed, organized and disciplined bodies quickly overrun empires that are impregnable to individual assaults.

Who in our advanced ranks does not see that much of our present therapeutics are unphilosophical, especially the general practice of killing exposed pulps and filling their canals?

What would be thought of the physician who, when called to cure, would as a rule propose to kill with caustics and then amputate the diseased member, instead of conducting it back to a state of health?

If we are to accomplish this latter, the sooner we get rid of the idea that we are to discover panaceas, and direct our efforts towards discovering and removing the obstacles to physiological conditions, the sooner we will be on the road to success. We must take our places as humble assistants of nature, and to do this, we must first be her apprentices.

It is absolutely indispensable that we shall know intimately and thoroughly what are physiological conditions, and next, how the accidents and obstacles to which they are liable, are brought about. Knowing these, the door is opened to improved therapeutical ways and means. This knowledge is not to be acquired with only elementary science, as our past experience has demonstrated.

How and where is it to be obtained, or what is an effective preparation for obtaining it?

In an article published in 1868 in the *Revista Medico Quiurgica y Dentistico* of Habana, of which I was at that time the editor, I wrote in regard to dental education:

"I by no means advocate the abandonment of the present dental colleges, but the limit of their teaching to matters peculiar to the specialty, the same as it is in the schools of ophthalmology; those have the same reasons for existence as do these, and for graduation in them the presentation of a medical diploma should be one of the conditions, as it is in these ophthalmic schools."

My opinions upon this point have not greatly changed. I can think of no sufficient reason why the chairs of anatomy, physiology, chemistry, general pathology and therapeutics should not be eliminated from our dental schools, in view of far greater facilities for teaching those branches being accessible in our medical universities, and it is therefore an extravagance to support in such close proximity two faculties for one and the same object.

In the preparation of our young men, the question should ever be before us: What branches of science are necessary for them to master, and where can they be acquired with most facility and perfection?

I apprehend that those who in the future enter the dental field as liberally educated physicians and surgeons, plus proper dental and mechanical training, will find ample field and appropriate rewards.

The medical profession is overflowing, and perhaps the only reason this class of young men has not poured into our ranks is, that hitherto ours has not been generally conceded to be a learned profession.

Well, let us make it a learned profession, and our problem will be solved!

I do not believe, as Dr. Frank Hamilton has suggested, that those who graduate in medical universities will not be content to practice the "lower branches"—"that this would be like trying to stand a cone upon its apex instead of its base."

A specialty so educated would not be a "lower branch."

A specialty is a development beyond and above general medicine, which is its base, just as a branch is a higher growth of the tree, and bearing its most perfect fruits.

A medical specialty represents in no sense merely the apex of a cone! It represents the entire cone, apex and base, its apex rising to a higher level of usefulness, standing firmer and penetrating further because of its broader base.

Gentlemen, when a considerable proportion of us are liberally educated, we will not require to descend in order to practice our art; we shall thereby carry our art with us up to that level. Nor with proper training can I understand how our mechanical and artistic skill may be less, because of our scientific culture being more.

What we require is not a smattering of science, but a thorough familiarity that can throw light upon our path. They must be well trained in the best scientific methods of observation, recognition and record of facts, and their collation and mathematical manipulation into theories that will bear the tests of time. With our main body raised to this standard, and with our present means of intercommunication, our profession will have a most gratifying future.

REPORT OF THE COMMITTEE

ON

INSTRUMENTS AND APPLIANCES.

Mr. President and Gentlemen of the American Dental Association:

The committee on dental appliances beg leave to make their report, as follows; but before presenting the same, will you allow us a word as a sort of preamble?

Last year, at Niagara Falls, we asked as an especial favor to your committee, that as many as could, who intended bringing before this body this year any new inventions or appliances, would send to your committee (who have this anything but easy or pleasant task on our hands of examining their productions, and presenting the same to your notice,) as far in advance of our time of meeting as possible, that we might have abundant time to thoroughly test them and give a fair and intelligent report of their merits. This suggestion has not been in one single case acted upon. Again, as last year, we have had a perfect avalanche of new productions heaped upon us, and, as the go-between, between you and them, we are required to make a not only readable report, but one that shall give satisfaction, not only to this honorable body, but also to those who have given much time and labor to the perfection of their different appliances and inventions. In this, gentlemen, we are afraid we shall, in a measure, fail; for, in the limited time given us for the performance of our duty, we feel that we can not do either you, them, or ourselves justice. So, begging the indulgence of all parties concerned, we shall make our report as brief as possible, and, by simply giving you a list of such things as have been brought before us, and stating the names of inventors, and the merits they claim for their different inventions, we shall seek to throw from our shoulders any and all responsi-

bility that we should feel rested upon us should we attempt to go into a detailed explanation of the many things that have been passed before us in rapid review.

From S. S. White's house we have quite a number of new inventions. Of their workmanship we need say nothing, for the stamp of this house is sufficient guarantee of their excellence.

First, a burr and drill rack for holding points used in the engine. A very neat little device, folding up like a fan when not in use, but when on duty, the simple touch of a spring causes the five leaves, of which it is composed, to open and expose in very convenient form a bristling array of about one hundred points.

Next, a wedge-cutter and compressor combined, the design of Dr. Miller. There seems to be not much that is novel about this little appliance, yet it fills a place upon our operating tables that could not well be left vacant.

Again, presented by the same house, is E. P. Brown's compressed rubber dam. The idea here suggested may be of much benefit, yet, none of your committee ever having experimented with it, we are not prepared to say any more than that it is in the market. This, gentlemen, is a patent, and we will simply say, that as Dr. Barnum, in the largness of his heart, saw fit to give, without hope of compensation, the rubber dam to our profession, we think it in poor taste for another to follow on his heels, using his brains, and claim a draft upon our pockets.

A set of four instruments, for the introduction of os artificiel fillings, with platina points, for the purpose of obviating the corroding of the points, which is very apt to take place with steel points, was presented from the same house.

S. S. White also presents a set of six scalers, designed by Dr. Benjamin Lord. These are nearly the same that received our attention last year, though they have been somewhat changed and improved.

Dr. H. Weston's set of twelve pluggers for amalgam, from the same exhibitor, were examined by us; the points are finely serrated, the handles octagon in shape, and they may be considered as just what is required for amalgam work.

A set of seven instruments was shown, the design of Dr. Atkinson, for use in introducing oxy-chloride of zinc fillings, from the same house.

An automatic plugger, the invention of Dr. A. H. Stevens, was presented by the same. This instrument has been reported on by us before, but since that time has been improved very much, and has also been so arranged that it can be attached to the burring engine, and it seems to us that it is a very useful little instrument.

S. S. White presents, also, a set of thirteen pluggers for gold work. They are the result of Dr. Chappel's ingenuity, and are designed more for the purpose of restoring crowns than for the ordinary work of filling teeth. They are very beautifully made.

The electric mallet, as improved by Dr. Webb, was again brought to our notice, he claiming for it an improvement over the instrument presented last year, by a reduction in both size and weight.

Dr. Geo. H. Cushings' changeable-angle disk-carrier we also examined. It is so arranged that the disk may be set at any angle needed. The simplicity of its design, and the perfect manner in which it does its work, make it a valuable adjunct to the operating case. Manufactured by S. S. White.

The same manufacturer also exhibited a similar one of his own. This differs somewhat from the above, in that it runs at but one angle, and has an attachment by which the motion of the disk may be instantly stopped, while the engine wheel is still in motion.

S. S. White presented two lock-bit angle attachments for the burring engine, one being a right angle, and the other giving a more acute back-action. The novelty of this instrument consists in the lock of the burrs, which is an improvement on the screw heretofore used.

From S. S. White, also, we have a little flexible rubber shield for the burring engine, the object of which device is to prevent the polishing powders used in dressing down fillings, from getting into the journal at the point of the hand piece.

Two little circular tooth brushes, designed for polishing and cleaning teeth, and to be used with the engine, and also a steel brush for cleaning out files and burrs, were presented by the same exhibitor.

A set of flexible nerve-cavity drills and burrs, to be used with the engine, was examined. They will be found very useful in many cases; these, also, are from White.

A movable extension spittoon was also examined, which has several valuable movements. It admits of a lateral movement of some ten inches, revolves on its pedestal, can be raised and lowered several inches, and, if desired, can be attached to an extension bracket. This, also, was from the house of S. S. White.

One of the finest and most useful appliances brought to our notice, was S. S. White's new operating chair. We would like to give a more detailed description of this new improvement than our limited time will admit of. A few of its points of excellence, however, we will mention. Its foot-board is self-sustaining at any point within its range; at its termination is an additional fixed rest, six inches above the platform; to this additional rest is attached a supplementary foot-bar, pivoted so that it can be thrown up

twelve inches above the platform, bringing it level with the seat, and shortening the distance for children. The whole body of the chair revolves on its base, but can be locked at any point desired, and thus become immovable. The head rest has many advantages, among which may be mentioned lightness and strength, facility and range of movement, and comfort and convenience to both patient and operator.

Dr. E. Housinger presented for our inspection what he terms his rotating gum lancet. This little instrument is intended to adapt itself to any side of the tooth to which it may be applied, the blade of the lance being pivoted to the handle and its surface concave, admits of its adapting itself very neatly to any portion of the tooth.

From Johnson Bros. we have a new gutta percha stopping. They claim for it some advantages over any other of a similar character now in the market; among others, its being less sticky and nearer the natural color of the tooth.

James Leslie presented a very beautiful specimen of his crystaline gold. This gold has some very excellent qualities, which can only be appreciated by testing them.

Dr. Williams, of Philadelphia, sent in for our examination a pneumatic mallet. We much regret that there was not some one present who was competent to explain its workings, for, from the limited knowledge we could gain of its powers, we were quite favorably impressed with it, and are sorry that we can not give it a more favorable notice.

S. S. White shows a set of seven scalers, designed by Dr. W. H. Atkinson. They are especially adapted to the removal of tartar from the lingual surfaces of the inferior incisors, fitting very nicely around the necks of the teeth, as none others do that we have seen.

He also shows some soft rubber polishing wheels, corrugated, thereby increasing the amount of surface, without increasing the size of the wheel. There are a half dozen different sizes and shapes.

A rotary file-carrier and porte-polisher is also shown by the same manufacturer, which can be attached to any engine, and seems to possess the merit of being less liable to get out of order than any we have seen.

Mess. Snow & Lewis, of Buffalo, show a hydraulic saliva pump, that can be attached to the wall, near the chair, and used to decided advantage, where the flow of saliva is abundant. It is a very ingenious appliance, and must be seen to be appreciated.

They also present an improved automatic plugger, having added two taper collars to the socket piece, thereby obviating any lateral motion, which is, in our opinion, a decided improvement in the instrument.

Dr. Bonwill again presents his electro-magnetic plugger for the exam-

ination of this committee, his claim for again bringing it before us being, that he has made some changes in the same that add much to its usefulness and ease in operating. Among the improvements may be mentioned its reduction in weight some two ounces, and in length one inch. The automatic break has also been so simplified as to render it, with the smaller magnets, more powerful than when triple the size. We believe it an instrument that has but to be tried to insure for itself golden opinions and a place in every dental office.

Dr. Bonwill's dental engine was also placed in exhibition before us, but as this instrument was reported on last year, we do not feel called upon to give it another notice, as it has not been materially changed since last presented.

The same inventor exhibited a disk-carrier, quite simple in its construction, cheap in price and effective in design. It commends itself to your favorable notice.

From the same, a hard rubber corundom disk. These are undoubtedly a valuable invention, and would meet with a ready sale were they in the market, though we understand they are not, but it is expected that they will be soon.

Among the more important appliances in operative dentistry are the following novelties:

A fountain spittoon of very elegant design and excellent workmanship, by Johnston Brothers. An important advantage which it possesses is its adjustability, both as to height and position, having a range in each direction of nearly two feet. Combined with it is a gold-trap. The construction of the whole is quite simple, and would seem unlikely to get out of order.

A portable and adjustable screen, by the same house, strikes us as likely to prove very convenient in many cases. It is capable of being easily managed and put into a small compass should occasion require.

The Morrison chair shown has undergone some improvements since our last report. A new head rest has been applied, and the whole chair is more comfortably upholstered. We believe that it is of advantage to have the operating chair more liberally furnished than has of late years been done.

An extension treadle, with toggle joint, was mentioned last year, but it is claimed to have been improved since then.

A disk-stand, with cups convenient for holding polishing pastes; an instrument-stand, the device of Dr. Fitch, capable of being readily shut up to lay away, are mentioned as new conveniences; also a form of screw mandrel, for holding soft disks of rubber or leather, having points upon the collar to prevent the disk from slipping.

The ingenuity of Dr. W. S. Elliott has furnished us, in this department

with two new appliances of seeming merit—a cheek distender, combined with reflectors, and a saliva ejector, to be used in connection with a fountain spittoon.

A root forcep and screw combined, the invention of Dr. French, we think will, in some cases, be found very useful. It bears some resemblance to the Hullihen forcep, but has only a single blade, which, by the closure of the handles, is forced up between the root and socket, giving a better hold.

A set of instruments, designed by Dr. Brouson, for filling with gutta percha, are very neatly made and well adapted for the purpose intended.

An improved syringe is shown, with a simple device for self-charging, suggested by Dr. Brockway. It has been highly commended for its convenience.

All the articles thus far mentioned, as well as an improved jack-screw for regulating teeth, the device of Dr. Southworth, were shown by Johnson Brothers.

The Buffalo Dental Manufacturing Co. show Snow & Lewis' automatic plugger, claiming for it recent improvements.

R. S. Williams brought to our notice a regulating screw made by Dr. Littig, intended to be used in connection with a plate for altering the position of teeth. We believe it will be found useful. He also called attention to a number of new forms of gold foil which are convenient to use. In one of the varieties designed to be used as non-cohesive, the quality is produced by the admission of a very minute portion of tin; in the other, the surface of the foil is covered with a slight film of carbon; in neither case is the effect visible in the appearance of the gold, but it is claimed to improve its working quality.

The automatic mallet of Dr. Salmon has been modified to its advantage, as he claims, and as we believe.

Dr. W. N. Morrison brought to our notice a screw-porte for adjusting retaining screws in the cavities of teeth. The contained wire having a thread ready cut upon it, permits of the screw being made of any desired length and cut off as required—a manifest advantage in some cases.

We desire to make favorable mention of a box for holding dentifrice, the device of Dr. Lyon. It has a hinged cover, is made of seamless tin neatly ornamented, and will, we think, be found very admirable for the purpose intended.

A set of exploring instruments, embodying suggestions of Drs. Jack, Perry and Brockway, will meet a need not heretofore supplied, for instruments wherewith a thorough examination of the teeth can be made in all cases.

We believe that the set of scalers devised by Dr. Riggs has not been mentioned before this body, and, although not entirely novel, they are well deserving of notice here. The same may be said of the smooth-point pluggers of Dr. Mills, which, like the foregoing articles, are also made by S. S. White. These are designed to be used with cohesive gold and by hand mallet.

Passing to the branch of mechanical dentistry, we find a new flask by Dr. French, intended for rubber or celluloid, having a spring, which, when the flask is brought together, snaps into a slot, giving notice of the complete closure of the flask, and holding in place the two sections. The idea is a good one.

Dr. Elliott has given us an improved articulator, which we can readily commend. Johnston Brothers make both this and the flask spoken of.

Dr. B. M. Wilkerson, of Baltimore, presents a vulcanizer, some features of which are entirely new, and those we will give you. This piece of work, when fully worked up in wax, is invested in the flask, which is firmly attached to the cover of the vulcanizer. The investing is different from any other manner heretofore presented; as the case is solidly invested, the flask will not admit of being separated. Then the whole thing is placed in the vulcanizer and steam raised, when the wax, by pressure of steam, is soon forced out through an opening of the cover. The rubber is then forced by a plunger driven home by a screw, through the same channel where the wax found exit, and the former place of the wax is thus filled with rubber. This ingenious appliance must be seen to be appreciated. It is not in the market as yet, but it soon will be.

A new preparation of rubber dam is presented by the Davidson Rubber Co., of Boston. It is claimed to be very elastic and durable, but of its virtues we can say nothing from personal experience.

GEO. L. FIELD,
A. H. BROCKWAY,
G. R. THOMAS,
} Committee.

REPORT OF THE SPECIAL COMMITTEE

ON

THE STATUS OF DENTISTRY.

By C. N. PEIRCE, Chairman.

Not unmindful of this occasion, I have prepared a short essay on the status of our profession which, if it be your pleasure and that of the association, I will present for their consideration. For most of the facts herein embraced I am indebted to the proof sheets of the work just issued, embracing a history of dentistry in this country during the century just closed, and to an admirable essay by Dr. J. W. White, on porcelain teeth.

Though the day of jubilee has past, and the stirring eloquence that has so fitly portrayed the spirit and memories of the events which have given more than ordinary interest to the closing century are now matters of history, yet it is not inappropriate that we too, at this late hour, should take a retrospective view of the events in which our profession is most interested.

While the orators on our nation's birth-day have dwelt upon the grandeur of the work of 1776, and our debt to the public men of that age; of the spirit of the people, the results of the century, America's influence in history, augmentation in intelligence, individual advancement, etc., etc., we too may have a word of encouragement and cheer, showing that while public men have been filling up the measure of their capacity and answering the demands of their age, others more limited in their opportunities and less clamorous for notoriety, have filled equally well an essential place in society, and produced results commensurate with their efforts.

Any review of dentistry in this country which shall cover the whole of the past century, must commence at a period when the limited number of

inhabitants and the stirring political events necessarily precluded the possibility of any special importance being attached to the curative art. Those first seeking this field of labor were generally of a class deficient in theory and experience, dentistry suffering in this respect even more than medicine.

In consequence of this condition, in the year 1776, the practice of dentistry, so far as accurate information can determine, was quite unknown. Ten years previous, however, (1766) Robert Wofendale, of England, established himself here, but meeting with less success than he had anticipated, he remained but two years, returning in 1768. Twenty-nine years later, on coming again to this country, he found quite a change, as in the interval several gentlemen had become established in the profession. It is believed that Mr. Wofendale (1766–1768) inserted the first full artificial denture ever made in the United States, William Walton, of New York, being the patient. From the year 1768 to 1782 the names of Isaac Greenwood, of Boston, and Mr. Baker, of Philadelphia, are the only ones associated with the profession of dentistry in America.

In 1782, with the French army, came Mr. Joseph LeMair, who a year or two later practiced in Baltimore and Philadelphia. Of him, our *first American* dentist, Josiah Flagg, learned the art and commenced its practice. At the same time (1784) James Gardett arrived from France and settled in Philadelphia. About 1786 John Greenwood began practice in New York, where he had been preceded by his brother, Clark Greenwood. In 1804 Horace H. Hayden offered his professional services to the Baltimoreans, and in 1805 Edward Hudson commenced practice in Philadelphia and John Randall in Boston; and two years later (1807) Leonard Kœcker performed his first dental operations in Philadelphia. These were the founders of dentistry in this country, men in earnest, and pursuing their calling with a singleness of purpose which commanded position and success.

From this period accessions to their number were slow, though continuous, until in the year 1825 the whole number of all grades was estimated at two hundred and fifty.

Nearly fifty years had now elapsed since the adoption of the Declaration of Independence, and this limited number marks the growth of our profession. Contrasting this with the last six years, from 1870 to 1876, when the graduates from our dental colleges alone numbered nearly nine hundred, and with the fact that the total number of practitioners at present in the country falls but little if any short of 10,000, we see the comparatively insignificant position our profession held at that time.

Until the year 1800 a large portion of the dental practice was in the hands of the medical profession, whose efforts were chiefly directed to the extraction of teeth, and the treatment of odontalgia by systemic remedies and topical applications of poultices, etc.

With the great majority of practitioners, dental operations were extremely crude and limited, consisting chiefly in the removal of the natural organs and the manufacture and insertion of substitutes. Indeed the latter operation was the distinguishing feature between the dentist, so called, and the medical man. The filling of teeth (practiced to a limited extent) with tin, lead, gum-mastic and sandarach, and also the operation of filing for the removal of decay—the latter in the face of much opposition—was principally confined to the better class of dentists, many of whom were graduates in medicine, and pursued to a moderate extent that calling also. At this period artificial dentines were carved from ivory or bone. It was not until the year 1817, that mineral or porcelain teeth were introduced from France by Dr. A. A. Planton, and they were not in general use until some years later, human and animal teeth being much employed, set in ivory or bone bases, or held in the mouth by pivoting or ligatures. Upper sets were retained *in situ* by springs attached to the lower plate, or to clasps around the remaining natural teeth; while itinerant practitioners were inserting partial sets without plates of any kind, by simply stringing the teeth on gold or silver wire, anchored at the extremities to the remaining natural teeth by ligatures. The securing of artificial teeth on metallic bases grew but gradually in favor, until the announcement of the principle of atmospheric pressure by Dr. James Gardett, after which it rapidly became popular. Transplanting was also in vogue; Mr. Joseph LeMair, in the winter of 1785–'6, claimed to have transplanted one hundred and seventy-six teeth in Baltimore and its vicinity.

Such is but a brief and extremely condensed view of the condition of dentistry in this country at the beginning of the present century. To accurately trace its growth from the above primitive status to its present advanced position, would require much careful labor, which should only be intrusted to an experienced historian; therefore, what I shall present to you will be but an indication of what such a history should embrace.

ARTIFICAL TEETH.

As has been noted, the manufacture and insertion of artificial dentures constituted much the larger part of early dentistry, as an individual occupation. The carving of plates and very crude teeth from the varieties of ivory was at first the principal occupation of a dental student. But with the introduction of metallic bases and of porcelain teeth, came not only the necessity for a knowledge of simple metallurgy, but also called for skill in the ceramic art.

The spirit of improvement which had become so thoroughly incorporated in the American heart, was not long in manifesting itself in this branch of dentistry. From the French and English systems of manufacture were

quickly evolved models and methods peculiarly American, which have ever remained distinctive features of mechanical dentistry in this country. Among those who zealously labored in this field, the names of Planton, Peal, Stockton, Alcock, Ambler, Spooner and McIlheny will be long held in remembrance.

Dr. A. A. Planton is entitled to the credit of being the first manufacturer of porcelain teeth in this country. He established himself in Philadelphia in 1817, and soon after, with the assistance of Abram Miller, whose pottery was then in Zane street, but afterwards in Willow, he commenced experimenting in the manufacture of porcelain teeth. In 1822 he brought before the Medical Society of Philadelphia the result of his labors, and from them received their certificate of approbation. Mr. Miller will long be remembered by the early manufacturers of teeth, not only for his efforts in furnishing them furnaces, muffles, slides, etc., but also for his kindness in communicating "his knowledge of pottery to the attainment of higher results in this new application of the fictile art."

Charles Wilson Peale, the next after Planton, was a public-spirited man, and much given to the study of scientific matters. The celebrated museum which bore his name was founded in 1775. He was also one of the founders of the Academy of Fine Arts, in Philadelphia. Mr. Peale, in 1822, though in his eighty-first year, spent much time in experimenting in the manufacture of mineral teeth, and with results highly satisfactory. But notwithstanding his success in this branch of the dental art, it was in the vocation of painter that he gained his most enduring reputation.

In 1825 Sam'l W. Stockton, of Burlington, N. J., commenced his experiments in the manufacture of mineral teeth. Following close upon him was Alexander Van Pelt and Joseph E. McIlheny, of Philadelphia; and a year later than these, (1828), was Hudson S. Burr, Lewis Roper, Robert McGrath and Daniel Neall, of the same city; D. C. Ambler, of N. Y.; J. R. Spooner, of Montreal, and in 1830, J. F. B. Flagg, of Providence, R. I., and J. F. Flagg, of Boston; followed, in 1831, by S. Spooner, of New York, and, in 1833, 1834 and 1835, by numerous gentlemen in New York, Boston, Cincinnati and Philadelphia, who, with varying success, increased the list of experimenters. Sam'l W. Stockton who, as above stated, began his experiments in 1825, was the first in the United States whose manufacture of mineral teeth attained any commercial importance. Most of those engaged in the business previous to him were practicing dentists, and manufactured exclusively for their own patients. To him belongs the credit of making the first effort to supply the profession with teeth, thereby relieving the dental practitioner from a duty so inconsistent with manipulative operations in the mouth. But his deficiency in scientific attainments and systematic accuracy in experiments—the latter so essential to satisfactory results—left yet a wide field for further improvement. This opportunity was not lost.

nor the field long without a laborer. Philadelphia furnished a young man, modest and retiring, though zealous and determined, and upon this work he entered in 1836, performing a series of experiments with a systematic accuracy which soon brought results far in advance of anything that had yet been obtained, and in less than two years Dr. Elias Wildman had the honor and unspeakable satisfaction of presenting to the profession teeth of such translucency and life-like appearance, and gum enamel, the color of which was so uniform and durable, that subsequent experiments to the present day have not surpassed them. "To him therefore must be awarded the credit of having reduced the manufacture of porcelain teeth to a scientific basis."

In 1844, a gentleman who is now with us, and whose interest and sympathies are so closely allied with those of our profession that it were useless to mention his name, having served an apprenticeship with his uncle, Sam'l W. Stockton, commenced the manufacture of incorruptible teeth, in an obscure room in a dwelling house, corner of Seventh and Race streets, Philadelphia. This was the initiatory step of an enterprise that has had no rival in the world, and with the history of which you, Mr. President and gentlemen of this association, are thoroughly familiar, under the firm name, at different times, of Sam'l S. White, Jones & White, Jones, White & McCurdy, then again Jones & White, and finally as at first, Sam'l S. White. The three-score and ten premiums from the various institutes, world's fairs, etc., which have been awarded to this firm, tell plainly the history of its success. The important improvements with which it stands accredited are too numerous to be here specified, but the extent of its fabrications and the demand for them by the profession at large, is a flattering eulogy upon Dr. Sam'l S. White's labors in behalf of the æsthetic and indispensable in an advancing profession.

The 4,000,000 teeth made annually in Mr. White's establishment, are probably about one-half of the annual production of the world, and mark a wonderful increase on the 500,000 which was the annual production of S. W. Stockton thirty-five years ago.

This large demand for teeth by dental practitioners, shows pretty conclusively that the manufacturing of teeth in private practice has been almost wholly abandoned, leaving the operator time for experiment in other fields, or for improvement in the branches of his specialty, which are more closely allied to the healing art.

From the original immature ivory base we may trace step by step the introduction of gold, silver and plantinum—at first bent into shape with pliers and punch, and subsequently swaged between metallic dies. Following after these, were the gutta percha base of Slayton; the molded tin base of Royce & Hawes; the cheoplastic process of Blandy; the porcelain base

of Loomis; the vulcanite base of Goodyear: the rose-pearl of McClelland; and celluloid, the latest production of all. Each of these has served a purpose, and as the practitioner has become familiar with their properties, his judgment has dictated the adaptability of either one or another for his special case.

The porcelain base has, from the first introduction of mineral teeth, been familiar to every manufacturer, but the difficulty of securing a perfect adaptation has confined its use to a limited number.

The methods of attaching artificial teeth to bases have been almost as varied as the bases themselves. The most crude of these was the pin through the tooth, retained *in situ* by being headed at both ends; then came the modifications of this, which were fastening the pin in the tooth by means of solder, sulphor, or amalgam. Following this was the pin soldered to the back of the tooth, the latter having been made with a piece of platinum therein. Next, metal flowed around the base of the teeth, in this way attaching them to the plate without pins. Vulcanite, amalgam, and finally porcelain were in this manner used, the latter so employed, though with some modifications, constituting Dr. John Allen's continuous gum work.

The securing of whole or partial sets in the mouth has always been a matter of interest and experiment. From the original, crude manner of tying with strings or wire, we have had numerous methods of varying utility. Lower sets were at one time loaded with metal, thus adding weight, that they might be held more securely by gravity. For upper sets, other means were necessary. Springs were first employed, but were discarded as better adaptation was obtained, and the principle of atmospheric pressure was recognized. Modifications of this principle have been suggested by Harris, Cleveland, Gilbert, Flagg, Dwinelle, and others, but with none are the results so generally satisfactory as with the original simple depression in the plate, which really supersedes all other methods for securing a full upper set in the month.

The operation of ingrafting with a wooden pivot a tooth upon a healthy, though pulpless, root, was one of early date; and simple and easily accomplished, as it was and is, there has been but little room for any great improvement. But the substitution of metal for wood, with the various means of retaining it in place, has made the operation practicable in a much larger number of cases, and in some of these an opportunity has been afforded for the most exquisite workmanship, securing, when embraced, results that will stand for years as monuments to patience and skill.

There is probably no operation, in this department of our art, that gives such complete satisfaction to the patient as a nicely-adjusted and permanently-secured pivot tooth.

In the transplantation and replantation of teeth, which was first publicly

noticed and strongly advocated by Hunter in 1771, there has been but comparatively little done, save for a short period immediately following the appearance of his paper in this country. The operation known as torsion, for the correction of irregularities, has also been practiced to but a limited extent, in consequence of the liability of unfavorable results.

We come now to the operation of filling teeth, and ancient though it be, it was long practiced with but little regard to physiological or pathological conditions.

Lead, gold and the gums (*sandu-rach* and mastic) constituted the list of materials first in use in this country. The first named, lead, was for many years, almost universally employed, but was eventually displaced by tin, which proved superior in value in most cases, and is still widely used and highly prized by many good operators. The resinous materials not proving durable, were never much used in American dentistry.

Gold, introduced here about 1795, has since held the most prominent position among materials for filling. The great variety of forms in which it has been presented to the profession, are familiar to you all. Suffice it to say, they have been so numerous that each operator could experiment to the extent of his inclination, and with most of the varieties excellent work has been done, though probably with some kinds more labor has been required to produce satisfactory results.

Next to gold, the three most prominent materials now used are amalgam, oxy-chloride of zinc, and gutta percha in some form. The first of these introduced here in 1833 by the Crawcours, two French empirics, was soon after the cause of an exceedingly prolonged and bitter controversy, a commotion which has passed into history as the "Amalgam War." With various modifications and improvements in its composition, it has now become a standard material and almost universally used, there being but very few out of the whole number of dental practitioners who do not, in special cases, resort to it.

The second, oxy-chloride of zinc, is in general use, but its great value consists in its appropriateness for temporary fillings, and in the protection of exposed or nearly exposed pulps, enabling the dentist to protect and preserve the vitality of the pulp in a much larger proportion of cases than hitherto.

Gutta percha, either in the form of the pink preparation, or that of Hill's stopping, (made of gutta percha and pulverized spar,) is also in general use, and quite indispensible to every good practitioner for temporary fillings in sensitive teeth, as well as those affected by periostitis. The fusible metals, at one time, were considerably employed, but results were so unsatisfactory that they are now entirely discarded.

The treatment of dental caries has widely varied with the different theories that have been advanced and sustained in reference to its cause. At one time it was supposed to arise wholly from systemic conditions; at another referred exclusively to outward and local circumstances. The first we may term the vital, the second the chemical theory. Then came the theory, which was almost universally accepted, termed the chemico-vital. At times there have been advocates of what is termed the parasitic theory, but these have not, at any period, been prominent in this country. The low forms of life so readily recognized in the cavity of decay, have generally been assigned the position of a sequence, rather than a cause, by most of those who have given the subject attention.

It is in and through this department—the treatment of dental caries—that the profession has gained its position and reputation. The assiduous and uncompromising efforts for the preservation and restoration of the natural teeth, which have been so persistent on the part of a large number of practitioners, have won for the profession a position in the ranks of the healing art, both creditable and compensating, and though, like other remunerative occupations, it has had a great proportion of empirical followers, yet the beneficial results flowing from the operations of the skilled and the conscientious, have been fully recognized.

In the anxious effort to save the natural teeth, there has, of necessity, been much done in the way of experiment and practices which, though at one time popular, have been abandoned for others thought to be more beneficial in results. In the treatment of the dentinal pulp, this has been unavoidable.

The effort at extirpation with a steel probe, both in connection with and without the actual cautery, gradually gave way to a less painful method, by previous devitalization with some preparation of arsenic, a process which was first used in 1834 by Dr. J. R. Spooner, of Montreal, but was not given to the profession until 1836, when his brother, Dr. Shearjashub Spooner, mentioned it in a small publication, entitled "A Guide to Sound Teeth."

The last ten years has greatly modified the use of this agent, the wise and physiological practice of capping exposed or nearly exposed pulps having largely taken its place. This method is not one of modern origin, by any means, for attempts at it are almost as old as the profession itself, but an increased pathological and therapeutical knowledge has rendered it much more effectual, so that now the proportion of successes is such as to make it orthodox practice. We may say, therefore, that the practice of pulp treatment has changed from that of destruction to that of preservation.

In connection with pulp treatment, risodontrophy has been employed by some to secure more thoroughly the health of the organs, and by others

to give vent to a dead and disorganizing tissue, and thereby averting periostitis and alveolar abscess.

One of the first dental operations upon record is that of tooth extraction, and for many years it was of chief importance in the reputation of the dentist, though practiced in the rural districts by physician and blacksmith, and in cities by barber and surgeon.

The instruments for the performance of this operation have varied much at different periods; the earlier ones were very crude, and at one period forceps were made of lead, to avoid the danger of fracture or injury to surrounding tissue, but these gave place to the key, which, in modified forms, for years and until quite recently, held a foremost place among extracting instruments. But this instrument is now almost entirely superseded by a class of forceps made with especial reference to the formation of each tooth, and in the hands of an educated dentist, are much more effectual in their execution.

With the extraction of teeth, the employment of anæsthetics is most intimately connected, since to a dentist and to this operation does the world owe its knowledge of the effects of two of the most valuable of these agents —ether and nitrous oxide gas. As to the true discoverer, there has been much vituperative discussion, but this has all passed into history, and the name of Horace Wells will always remain vivid in the minds of future generations, as one of the greatest benefactors of mankind.

We have noted above, but briefly and imperfectly, the various progressive practical stages through which the profession has passed, and by which it has rendered incalculable service to the public, and from them in return gained their confidence and an enviable regard second only to that awarded to the general medical practitioner.

To name in detail the multiplicity of aparatuses which have been so serviceable in the hands of the dental practitioner, would occupy more space than the limited time alloted to me would permit. Suffice it to say, that while they have greatly lessened the fatigue of his labor, they have increased its efficiency and excellence. Many of these instruments have been the result of genius in the profession. Would we could say it to the honor of such, that they had been given to the profession unincumbered by patents and royalties. One however, the rubber dam, above all others, must here receive notice; first, for its intrinsic and inestimable value, and second, for its being a free and generous gift from the inventor. Long may the name of Dr. S. C. Barnum be cherished in the hearts of members of the profession, and long may his spirit be emulated.

We have spoken of the progressive development of our profession, and the honorable position it occupies. A word or two now in reference to the

means which have been instrumental in its advancement, and to a few of the spirits who were efficient in securing these advantages.

This advancement has been stimulated by and, indeed, is largely due to the publication of journals, the formation of societies, and the establishment of colleges.

Of those whom we have enumerated as the founders of dentistry in this country, there is probably no one whose efforts were more wisely directed and persistent, and whose influence was more widely felt than was that of Horace H. Hayden. He was not alone in the work, but his high standard, exhaustless energy, and indomitable will, did more to systematize and give status to the profession than that of any other man. From the time he entered the profession in Baltimore, in 1804, until his death, he was constantly occupied with efforts for its advancement.

After numerous unsuccessful attempts, extending over several years, he was, in 1839, instrumental in starting the first dental periodical, the "American Journal of Dental Science," an important event in the history of dentistry. The scattered members of the profession who had long toiled in comparative obscurity, almost unknown to each other and to the world, found in this journal an appropriate medium through which to communicate with each other.

Soon following this publication, was the formation of the "American Society of Dental Surgeons," and at its second annual meeting an arrangement was made with the publishers of the Journal by which it became both the property and organ of the association. Two years afterwards, another society of dentists, like that in Baltimore, was organized in Richmond, Va., and in August, 1844, a third was formed in Cincinnatti, Ohio, styled the "Mississippi Valley Association of Dental Surgeons."

In August, 1850, the "National Convention of Dentists" was formed, and its first annual meeting was held in Philadelphia. Just previous to this, the "Pennsylvania Association of Dental Surgeons" was organized, and some years subsequent, in 1863, the "Odontographic Society," of Philadelphia.

In addition to these, there are some seventy other state and county societies, most of the latter professing to hold their meetings monthly.

The "American Society of Dental Surgeons" had rather a varied and turbulent existence; crimination and recrimination were indulged in to such an extent among its members that it was eventually destroyed. But notwithstanding this unfortunate termination, it left its imprint upon the profession in behalf of associated and systematic effort. Following close upon its demise, sprang up the "Mississippi Valley Association of Dental Surgeons," and the "Pennsylvania Association of Dental Surgeons." Both

of these are still in existence; the latter, for over twenty years, has not omitted its regular monthly meeting, and has largely contributed, not only to the greater professional excellence of its members, but has engendered among them a feeling of friendship and sympathy that is remarkable in professional life.

The establishment of the "American Dental Convention" was the outgrowth of the local associations, which were felt to be insufficient to answer the demands of the profession. But in a few years the necessity for a delegated and representative body was felt among the more advanced portion of its members. This desire rapidly grew, and finally became so definite and expressed, that at Niagara Falls, in 1859, largely through the effort of Prof. J. H. McQuillen, the "American Dental Association" was organized, with the election of Dr. Wm. H. Atkinson as its first president. This, from its character, has been the leading, most important and influential dental association in the United States, and, we trust, from the jealous care with which its annual conferences are guarded, it will long merit the reputation it has so justly won.

From the issuing of the "American Journal of Dental Science," afterwards called the "American Journal and Library of Dental Science," in 1839, by E. Parmly, E. Baker, and Solymon Brown, the first periodical in the world devoted exclusively to the interest of dentistry, the profession has recognized the advantages accruing from well directed dental journals, vehicles, as they are, for the interchange of thought. They are, when judiciously conducted, next to colleges, the most efficient instruments for improvement and education. Considering the possibility of placing one or more of them in the hands of the most obscure practitioner, we doubt if they should stand second to any other influence in promoting a desire for professional attainments and excellence in professional skill.

Of some thirty that have been started, the large majority have had but an ephemeral existence, but of even these, we trust, good can be recorded, in having stimulated some to a higher effort. The fact that of the surviving, the most prosperous and influential journal is published by a dental manufacturer, has been thought by many detrimental to its usefulness. While this may possibly be the case, to a limited extent, yet a compensation far outweighing this, is too conspicuous not to be worthy of mention. The interest the publisher has in extending the circulation of his journal, stimulates him to procure for it the best editorial and contributive talent, the result of which is thus brought within the reach of a much larger class of readers, for a pecuniary consideration much less than it could otherwise be obtained.

In the production of standard dental literature, America, it is feared, compares unfavorably with England. As we have sown, so shall we reap.

For years American dentists have almost exclusively given their undivided energies to securing excellence in practical work. Their methods and auxiliaries far exceed those of any other nation, and so, in the effort to gain proficiency in results, time has, to a great extent, been monopolized, with the sacrifice of mental culture. It is to be admitted, with much regret, that England excels us in giving to her dental student a higher degree of scientific attainment, a more liberal and thorough theoretical education; and while it is from these that most of the standard works must come, we of America must accept this unfavorable comparison. But in doing justice to foreign authors, let us not do injustice to our own. We have Parmly, Fitch, Harris, Bond, Taft, Arthur, Richardson, Garrettson and others, each of whom have marked an advance in our profession, and pointed to something higher.

Of these works, some are now only of historic value; others have become standards of reference, and a few are employed as text books in our colleges.

While dental schools and colleges were instituted through the energetic efforts of a few men of liberal views in the profession, their necessity was made most manifest by the cupidity and illiberal spirit that controlled a large portion. While private preceptorship was offered for a compensating fee, and the teacher was honest in imparting freely the best and, indeed, all that he possessed, the necessity for other means of education was not so keenly felt. But soon empyricism manifested itself in its worst form, through extortion in fees demanded, professional jealousies, and secret methods, until private studentships were an abortion, and schools of instruction became indispensable. Hence resulted the establishment of the following institutions:

The Baltimore College of Dental Surgery, the first institution of the kind in the world, was inaugurated in 1839. The Ohio Dental College was chartered in 1845. The Philadelphia College of Dental Surgery in 1850. From this college, after completing its fourth session, the faculty resigned, and in 1856 procured the charter of the Pennsylvania College of Dental Surgery. In 1863 the Philadelphia Dental College was chartered, and in 1865 the New York College of Dentistry. In 1866 the Missouri Dental College was founded, and in 1867 the Dental School of Harvard University. The Boston Dental College was instituted in 1868, and in 1873 the Maryland Dental College, and finally, in 1875, the Dental College of the University of Michigan held its first session. Two or three others have had an ephemeral existence, but never attained importance enough to give them an influence. Of these schools twelve are now in existence, and the whole number of degrees they have granted is about 2,370. The influence exerted by these in behalf of an advanced education has evidently been very great.

Since the establishment of these institutions of learning, their progress has been marked, and a definiteness in instruction has been attained which promises yet more rapid advance. This growing desire for a more liberal education is not confined to those holding connection with colleges. The former graduate and operator, with years of experience, daily feeling the embarrassment of his limited knowledge, demands a more liberal curriculum and a more extended and thorough general education, that this additional wisdom and strength may make his successor a more efficient and useful practitioner.

Whatever may be our present deficiency in giving instructions, compared with the private pupilage in vogue in the early part of this century, our advance has been highly creditable and almost unprecedented, though as we have intimated, much remains to be accomplished. Through practical results in prosthetic and æsthetic dentistry, we have little hesitation in claiming for the profession an influence for the improvement in both the physical and moral condition of society, and we do this with the knowledge that empyricism and dishonesty are active competitors; but the tenure of these is based upon ignorance, and therefore with the diffusion of education the influence of this class must gradually diminish.

In this hasty and imperfect sketch of the progress of our specialty during the century just passed, we have desired to avoid any unseemly idea that perfection had been attained. With the advance that every department is making, we are warranted in believing that the knowledge and the practice of to-day will seem as crude to those who shall celebrate the second Centennial of America, as do those of our predecessors to us.

Let us be content if the years in which we labor shall mark an advance which shall be recognized as permanent, and tend towards the end to which we all should aim—perfection.

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